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TRANSACTIONS

OF THE

AMERICAN CLIMATOLOGICAL ASSOCIATION.

MAY, 1883.

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TRANSACTIONS

OF THE

~~SECOND ANNUAL MEETING~~

OF THE

AMERICAN CLIMATOLOGICAL ASSOCIATION

HELD IN THE CITY OF NEW YORK

MAY 27, 1885

NEW YORK
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1886

OFFICERS, 1885.

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THE

AMERICAN CLIMATOLOGICAL ASSOCIATION.

The second annual meeting of The American Climatological Association convened in the New York Academy of Medicine, May 27, 1885, and at 3 P. M. was called to order by the President, Prof. A. L. Loomis, M. D.

The minutes of the last annual meeting were read and approved.

John T. Nagle, M. D., of New York, presented the association with the report of Daniel Draper, Ph. D., director of the New York Meteorological Observatory for the years 1881, 1882, 1883, 1884, and the first few months of 1885, accompanying which were tables showing the daily mortality from pneumonia for the corresponding periods, which was so fatally prevalent in New York city and which attracted so much attention. The tables also give the age and sex of the decedents. The contribution was, on motion, received, and a vote of thanks tendered the donor.

The President appointed Drs. J. C. Wilson, Boardman Reed, F. C. Shattuck, B. F. Westbrook, and E. D. Hudson a committee to nominate officers for the ensuing year.

THE ANNUAL ADDRESS.

By ALFRED L. LOOMIS, M. D., LL. D., New York,

President.

Gentlemen of the American Climatological Association:

If I understand aright, this association was organized that representative medical men from different sections might come together and, from their different views and experiences, endeavor to determine the therapeutic value of the various localities which have been alleged to have the power of arresting or curing chronic diseases of

the respiratory organs, and to discuss their ætiology, pathology, and treatment. If I had been present at its organization I should have advocated giving it a broader scope, and including in our studies diseases of the vascular system and the therapeutic value of our mineral springs. It is hardly necessary that I should recite to you all that has been and is being accomplished in these fields by our European brethren. One only needs to read the history of almost any chronic disease from the pen of recent continental writers to realize how large a part of their treatment is summed up in advice to spend longer or shorter periods in this or that health resort, or "take a course at some mineral spring." That recoveries from very many chronic ailments are reached by such sojourn no one will question. The hundreds from our midst who visit European sanitariums each year is a testimony that either they have something in climate and mineral waters which we have not, or that the medical mind of Europe has systematized and rendered efficient these powerful therapeutic agents. A careful study of this subject has convinced me that neither in climate nor in mineral waters are they superior to us, but in their more thorough system of employing these agents. The profession at large on the Continent are far more intelligent as regards differences in climate and the composition and effects of the different mineral springs in Europe than American physicians are of those of our own country. The profession in this country require education in these matters. It is only a few years since we have made any systematic attempts to gain definite knowledge in regard to our health resorts and mineral waters. It is the province of this association to stimulate the profession to greater zeal and a more harmonious working in this important field. Through properly organized committees it will determine the real merits of the various health resorts which at present, and may in the future, claim our patronage and support. It will endeavor to place those that are found worthy of its indorsement under the supervision of intelligent physicians, who, by the aid of local authorities and perhaps by legislative enactment, may render them more efficient for the cure of those diseases to which they are especially adapted. In the more important of such health stations the benevolently disposed will be urged to establish and endow sanitariums, where the poor, or those who are not able to fully meet the expenses of a sufficiently long stay to reach a cure of their maladies, can be aided and taken care of. By the carefully kept records of such sanitariums a more definite and positive opinion of the relative advantages of different health stations can be reached.

As an indication of what may be accomplished in the way of establishing such charitable sanitariums, I will give the history and a brief description of the "Adirondack Cottage Sanitarium" and the plans which have been adopted by its managers as they have been transmitted to me by Dr. E. L. Trudeau, who deserves the credit of being the pioneer in this noble work in this country.

The plan for the Adirondack cottages was first brought to the attention of several visitors to that region in the summer of 1883. The project at once met with such hearty responses that it very soon took a substantial form. Donations in money were freely offered, physicians promised their professional services, and gentlemen residing in the Adirondack region for health readily assumed the superintendence and management of the future institution. As a result, the unpretending establishment which now stands within a mile and a half of Saranac Lake village sprung into existence. It represents an attempt to put within the reach of patients of moderate means, suffering with pulmonary disease, the benefit to be derived from the Adirondack climate, a well-regulated out-door life, and proper medical care. It is not intended as an asylum for hopeless cases, but as a means of restoring to health those in the early stages of pulmonary phthisis. The cottage plan has been adopted, each cottage to be tenanted by two or, at the most, four patients. The cottages are clustered around a commodious main building, where all the meals are served, while its upper floor is arranged for those invalids that require constant care. It is neither altogether a charitable institution nor a self-supporting hospital, but embodies some of the features of both—that is, the expenses are to be met by yearly subscriptions of benevolent persons, and in part by weekly payments made by the patients themselves. Five dollars a week has been fixed as the amount which for the present will be required of patients. This sum is to cover all expenses. Should the yearly subscriptions increase sufficiently, this will be reduced to the lowest sum that will enable the managers to meet the expenses of the institution. As no salaries are to be paid except for manual labor, patients will reap the full benefit of the yearly subscriptions. Invalids will be urged to exert themselves in flower-raising, for which every facility will be furnished in the future, as both an agreeable and a healthful pastime, and an additional source of income to the establishment. It is proposed that some well-equipped tents shall be raised on the grounds, that the benefit of camping may be within the reach of those for whom such a mode of life is advisable. The site of the Sanitarium

seems especially adapted to its requirements. It is on a small plateau about two hundred feet above the valley of the Saranac River, from which one of the most extended mountain views of the region may be had. It is a sunny spot, facing the southeast, and backed by a high wooded hill, which shelters it completely from the prevailing winds, while its sandy soil and gentle slope insure dryness and perfect drainage. Allowance for the growth of the establishment has been made in the plans of the main building, so that the simple erection of more cottages, as they are needed, is all that is necessary to enlarge the scope of the undertaking. Its present capacity is limited to twenty patients. It is incorporated under the name of Adirondack Cottages, under the control and management of a Board of Governors and a House Committee. Dr. Alfred L. Loomis, of New York city, is examining and consulting physician, Dr. E. L. Trudeau, of Saranac village, attending physician, and Dr. C. F. Wicker, of Saranac village, assistant physician.

I have presented to you this report from Dr. Trudeau with the hope that it may stimulate other resident physicians at our different health stations to similar charitable work, and that some action may be taken by this association at its present meeting on this important subject. May we not hope that, in the near future, this association will become the forum for the discussion of those vital questions in the ætiology and therapeutics of diseases of the respiratory and vascular organs which are to-day engaging so largely our most brilliant workers in the field of medicine? Let it be a place where good and true men can meet on a common ground, with no medical politics, no ethics, no jealousies, with but one end in view—real advancement in our knowledge of disease. If this association is to live, let it have a scientific record.

The Influence of the Recent Views of the Ætiology and Morbid Anatomy of Pulmonary Phthisis on its Climatic Treatment.—As an introduction to the work which will engage us at our present meeting, permit me to say a few words on this subject.

There has, perhaps, never been a period when there was so great uncertainty in the minds of the profession in regard to the ætiology and morbid anatomy of phthisis as the present. For one class of observers pulmonary phthisis is an inflammation of the pulmonary substance, which may or may not be complicated by tubercle. Another class maintain that tubercle is the primary and essential lesion of all phthisis. Still more recently certain investigators maintain that there is a specific material which may or may not be accom-

panied by the histological elements of tubercle, but which always has a specific form of *bacillus* as the sole exciting cause of its development.

Whatever conclusions may finally be reached as to the exact nature and cause of phthisical processes, clinically we must always recognize two varieties of phthisis:

First, acute phthisis, the morbid changes of which are a complex of inflammation and the rapid development of tubercular tissue in the lung substance.

Second, chronic phthisis, the essential pathological changes of which are consolidation and induration of lung substance; tubercle may or may not be its primary lesion, but it is usually present in its advanced stages. During the past two years my own examinations of the lungs of those who have died with the clinical history of chronic phthisis have convinced me that, in advanced phthisical processes, tubercular tissue can always be found, but I am not prepared to state that the development of tubercle is the primary lesion in all or in the majority of cases.

In very many I am confident that a non-specific infiltration of the lung precedes tubercular invasion and furnishes suitable soil for the development of tubercle, as well as for the growth and multiplication of tubercle bacilli when they are present.

Koch's statements that the repeated entrance into healthy lungs of small numbers of the specific bacilli of tuberculosis will cause chronic phthisis, and that the simultaneous admission of numerous bacilli will produce acute phthisis, stand as yet unproved. As Beichart and Segel state, it remains to be shown how and when, in any individual case, the microbes effect their entrance into the system, or why their entrance takes place so readily in one case and not in others. Why do a large number of persons resist their entrance under seemingly the most favorable conditions for their introduction?

If phthisis has its origin in an infection, it seems evident, from a clinical as well as a pathological standpoint, that certain preparatory tissue-changes must take place in the lungs before the infection can be received, or, in other words, before bacillary invasion can become effective. Both experiments and observation seem to show that these bacilli, whether developed inside or outside the body, can not thrive unless certain conditions are present. We ought to welcome every new method of investigation, and do nothing to discourage the boldest flights of pathological speculation. But the crucial

test for all such speculation must always be a clinical one. We must hold rigidly to facts drawn from direct observation during life, to our clinical facts, and never endeavor to interpret them so that they shall accord with either our speculations or our theories. By this standard there are three factors which may be regarded as preparatory to the phthisical infection, if such infection shall be found to exist:

First, a state of constitutional feebleness, either inherited or acquired, which diminishes the resisting power of the individual and renders him abnormally susceptible to diseased processes.

Second, a condition of the upper portion of the lungs, marked by feebleness and slowing of the circulation, which predisposes the individual to phthisical processes.

Third, the establishment of localized inflammatory processes in the bronchi, lung substance, or pleura.

I think no one will question that the treatment of phthisis which is to-day attended by best results is that which has for its object the invigoration, by every means possible, of the general health, and the avoidance of those conditions which predispose to or favor local pulmonary inflammations. If we appeal to clinical medicine and ask how these therapeutical indications are best reached, the unqualified reply is, by good hygiene, good food, a suitable climate, and those medicinal agents which promote and maintain that normal performance of the digestive and assimilative processes which is essential to healthy nutrition. At the present day I think that the majority of careful and unprejudiced observers are united in the opinion that the most important of these agents is a *suitable climate*, which acts therapeutically in arresting early phthisical processes in two ways:

First, by its invigorating effects on the general system and its power of improving defective nutrition.

Second, by its local effects in preventing diseased processes in the lungs, and in arresting such processes after they are developed.

Before proceeding further, let us inquire what we are to understand by the term *climate*. Dr. Parkes defines it as the sum of the influences which are connected with the solar agencies, the soil, the air, and the water of a place. Dr. Billings, in his recent article in Pepper's "System of Medicine," understands by the term climate the sum of meteorological influences, the most important of which are temperature, humidity, and winds. Dr. Schreiber, in his address before the Austrian Meteorological Society, states that the term

climate, which has hitherto been employed to denote a vague, indefinite specific, of which no reliable account could be given, appears now as something infinitely clever and very simple, being, in fact, nothing more than pure air uncontaminated by miasms, with no organic or inorganic substances, and one in which water precipitation or rain is not unduly deficient. He shows that it is neither warm air, nor cold air, nor dry air, nor moist air, that is wanted, but an abundance of pure air.

To assume that any particular climate exerts a specific influence upon pulmonary phthisis is absurd. That certain climates are better than others there can be no question, but in regard to the climatic constituent which makes the difference there is a great diversity of views.

Dr. Jaccoud, in his "Lectures on the Curability of Phthisis," states that information derived from writings on this subject can not take the place of knowledge furnished by direct observation. For the reason that two places possessing similar climates may have very different therapeutic values, and this solely on account of their topographical situation, the meteorological tables of a locality give no reliable information on this subject.

Again, he states that the impressions made upon the organism by different climates are to some extent independent of the certain and describable phenomena which constitute the climatology of a region. With similar mineral waters, barometrical, hygrometric, and anemological conditions, two places may still be most dissimilar in their effects, either upon the healthy person or upon the invalid. It is vain to seek in the table of atmospheric changes for the explanation of that special impression which the climate of a region makes upon the affected organism—an impression which, in fact, is indefinable, and of which the cause can not be ascertained; it must be felt to be understood; this fact constitutes one of the fundamental difficulties of the climate problem. As a consequence, we have one class of observers maintaining that high altitude acts therapeutically on diseased lungs by the lightness of the air, which relieves the lungs from undue pressure, and thus permits them to gradually return to their normal state. Others hold the view that the rarity of the air induces more rapid respiration, and in this way tends to restore the diseased lungs to their former healthy elasticity. Others again contend that solar radiation is the great curative agent. But *purity of atmosphere and consequent freedom from germs* seem to me to offer a more satisfactory solution of this much vexed problem. In the pres-

ence or absence of these organisms is to be found an explanation of the therapeutic differences in the air of different localities.

Sir John Lubbock, in his address to the British Medical Association, states that it is calculated that the smallest sphere of organic matter which can be distinctly defined by the most powerful microscope is about $\frac{1}{18000}$ of an inch in diameter, and that a particle of this size would contain many millions of molecules. These molecules may be germs of organic life. Such a thought opens a wide field for the origin of the microbes of disease, even when we shall have become familiar with the different species of every known infection.

Professor Tyndall's experiments have shown conclusively that the air, as we ascend, becomes freer from atmospheric germs, and that dust-laden air is necessary for the production of living organisms in vegetable infusions; that such vegetable fluids, after months of exposure to optically pure air, remain free from infusorial life.

That atmospheric germs are much more abundant in cities and large towns than in the open country has also been conclusively shown by Professor Tyndall's experiments, as well as that these germs are diffused through the air of different sparsely inhabited localities in varying degrees.

Dr. Andrews, in his Lumleian lectures, states that the microorganism which excites phthisis, whatever it may be, at certain altitudes is no longer met with. It seems evident, however, that, if purity of atmosphere is the essential therapeutic agent of high altitude, all elevated regions do not furnish it. Experience has shown that when the inhabitants of elevated regions, who have long enjoyed an immunity from phthisis, have engaged in manufacturing pursuits, phthisis has become a prevalent disease, and there are localities of very high altitude where phthisis has always existed. It is a reasonable inference that those localities of high altitude which are now, and which may hereafter be, found favorable to the climatic treatment of phthisis must remain sparsely inhabited; and that, as soon as the hotels, boarding-houses, and sanitariums in such regions become numerous or overcrowded, such health resorts will lose their therapeutic power.

Another climatic condition which, I believe, is as essential as altitude to purity of the atmosphere in any locality is *porosity of soil.* In localities where the soil drains slowly and imperfectly there is a peculiar dampness which acts most powerfully in developing phthisis. Dr. Henry I. Bowditch, in his address on consumption before the

Massachusetts Medical Society in 1862, states that soil moisture is one of the chief causes of phthisis, and that localities where there is a dry soil are comparatively free from the disease.

Dr. Buchanan, in his classical report to the Privy Council, makes the statement that *dampness* of soil is one of the most prolific causes of phthisis to the inhabitants living upon it.

Laennec, in his work on "Diseases of the Chest," states that for ten years he had charge of a nunnery outside of Paris, where the ascetic spirit which controlled the minds of its inmates was most severe, and led to no less serious than surprising results; not only was the attention of the nuns habitually fixed upon the most terrible truths of religion, but the discipline was such as to bring them as early as possible to a complete renunciation of their own wills. During the ten years in which he had the medical charge of this establishment, three times he witnessed the death of its entire membership from consumption. Laennec ascribes this astonishing mortality to the depressing effects of mental suffering, but it was afterward found that this nunnery was built in a clay cup, which caused such constant dampness in the buildings that they had to be abandoned. From these statements it seems evident that the atmospheric dampness which is so powerful in developing phthisis is not necessarily present in those localities where there is the greatest amount of rain-fall, nor is it necessarily present in localities which are in close proximity to large bodies of water, but it is a dampness which is due to a peculiar conformation of the soil; in all clay regions such dampness exists. The air of such localities is saturated with a moisture which is laden with germs of special vitality. The amount of rain-fall in any region tells little of its atmospheric moisture. In some localities where there is little or no rain-fall the air is constantly loaded with moisture almost to saturation, on account of the non-porosity of the soil. Frequent showers unquestionably purify the atmosphere in localities where the conformation of the soil favors rapid and free drainage.

The presence of extensive evergreen forests has been found to have a powerful purifying effect upon the surrounding air. It is questionable if winds purify the atmosphere of a locality; that they act prejudicially upon phthisical invalids is sustained by the experience of most observers. There are observations which show that ozone, or that electrical condition of the atmosphere in which it is present, acts as a powerful purifying agent in the atmosphere—an oxidizing disinfectant. While oxygen requires a considerable degree

of heat before it will combine with other substances, ozone will do so at an ordinary temperature. The air of a locality may not necessarily be impure because no ozone is present, for it may already have been expended in oxidizing organic substances in the surrounding atmosphere; yet the presence of ozone in the atmosphere of a locality is presumptive evidence that the air is optically pure.

As has already been indicated, there are from our present standpoint two important objects to be attained in the treatment of phthisis: *First*, to prevent the entrance of microbes into the lungs through the respired air. *Second*, to maintain such a healthy condition of the pulmonary tissue as to prevent those abnormal changes in the lungs which may favor the development and activity of such organisms, if they have gained an entrance into the respiratory organs. The importance of maintaining a healthy condition of the lung-tissue is in danger of being overlooked in the earnestness with which attention is now being directed to the bacilli of tuberculosis. If we are to regard the presence of tubercle bacilli in the expectoration as essential to the diagnosis of a fully developed phthisical process in the lungs—and I am convinced, from my experience after very many examinations, that they are never absent—the important clinical question arises, Can the bacilli in diseased lungs be destroyed? Attempts in this direction have been made principally by means of antiseptic inhalations. This is becoming the fashionable method of treating all diseases of the respiratory organs, and respirators of various devices, charged with some antiseptic, are now being extensively used in the treatment of phthisis. I would not unfairly criticise such treatment, but I am convinced, from my own experience in this direction, that the clinical evidences of the effectiveness of such inhalations in destroying or diminishing the number of tubercle bacilli in phthisical processes are entirely wanting. Although this method of treatment has recently been greatly stimulated by Koch's discovery, we have as yet no reliable clinical data that it has any influence upon the tubercle bacilli. If antiseptic inhalations have apparently acted beneficially in any case, I am convinced that it has been due to their favorable influence upon the mucous membrane and secretions in the higher air-passages, and not to their action upon phthisical changes in the lung substance. It must be admitted, however, that the antiseptic treatment of disease is as yet in its infancy, and that our present methods are unquestionably imperfect. There is very great doubt if, by the methods of inhalation now in use, antiseptic materials ever reach the pulmonary tissue. Perhaps the

ingeniously contrived pneumatic cabinet of Dr. Williams, of Brooklyn, may accomplish the desired result. Certainly the principle upon which his cabinet tends to inflate residual lung tissue is sound, and may be found, by its practical results, to accomplish what is desired in this direction. It is doubtful, however, if an antiseptic inhalation should be brought in contact with the diseased lung tissue, if it would destroy or render inoperative the bacilli of tuberculosis. The following report, in a recent number of the London "Lancet," bears directly upon this point: Dr. Morel Mackenzie reports a case of laryngeal and pulmonary tuberculosis, which originated in a simple chronic catarrh of the larynx, in which he asserts that, for a considerable time after frequent microscopical examination of the secretion from the inflamed laryngeal membrane, no bacilli could be found; but, after a time, the inflamed laryngeal membrane began to present the unmistakable appearance of tubercular laryngitis, and then the laryngeal secretion contained numerous tubercle bacilli. And he states that, while the laryngeal symptoms were relieved by the local use of iodoform and other antiseptics, such antiseptic applications did not diminish the number or destroy the vitality of the tubercle bacilli. From these observations it would seem, first, that the inflamed laryngeal membrane, after the non-specific laryngeal catarrh had reached a certain stage, furnished a fitting soil for the bacillary development, as a secondary and not a primary lesion. Second, that, if the direct topical application of antiseptics to the seat of the development of bacilli will not destroy them or even diminish their number, we can expect little benefit in this direction from antiseptic inhalations on tubercular processes in the lungs. Dr. Pollock, of London, concludes his *résumé* of modern theories and treatment of phthisis in the following words: "No parasite theory of phthisis can lessen the importance of the use of cod-liver oil. Supposing we possessed a local remedy of sufficient power to insure the destruction of such bacilli as are met with in the secretions of phthisical subjects, their rapid reproduction would soon overtake our treatment. I fear in this direction we may have much experience, and many such experiences, and many disappointments. Finally, to sum up the brief review which we have been able to make of these new doctrines, it would appear that, while some facts—such as the presence of bacilli in the cases of phthisis, and their absence in the other affections of the lungs and air-passages—are fully proved, there are some assertions of those who hold that such appearances in the lungs and its secretions are the proximate and invariable cause of

the disease which we must for the present hold *sub judice.* Among these doubtful theories are those which concern the production of the parasites. Whether they may be endogenous or introduced from without, whether they may not find their birth in certain blood changes which are the outcome of pyrexial action in the system, or whether they are the product of a like morbid condition in other animal bodies, and from them introduced into other organisms by contact or infection, must remain for the investigation of later pathology. We may safely relegate these interesting questions to ardent students, who are now everywhere carrying on new observations, and for ourselves, knowing well that all pathology is progressive, and that we see but a portion of truth at any time, be content to await the result. That there is some intimate connection between the development of the micro-organisms of disease and atmospheric impurities, every day's clinical observation seems conclusively to establish. Our modern surgery bears testimony to such a conviction in the minds of careful and experienced surgeons."

As yet the science of bacteriology has not determined the origin of any one of the many micro-organisms which have been so minutely described and carefully cultivated. All varieties of putrefactive bacteria may have an atmospheric origin. And it is at least reasonable to suppose that some of the so-called specific bacilli and micrococci may have a similar origin. If such an origin can be admitted, the importance of a pure atmosphere as a preventive measure, as well as a curative agent in phthisis, is apparent. I will give the clinical histories of two cases which bear directly upon this point:

Case I.—Early last summer a gentleman, twenty-six years of age, consulted me, having the well-marked physical signs of the first stage of phthisis at his left apex; an examination of his sputum showed it to contain numerous tubercle bacilli, his general condition being such that he was able to exercise for hours in the open air. I advised him to spend the summer in the Adirondack Mountains. He returned to me in November, having been five months in the woods in camp life. He had gained twelve pounds in weight, lost his cough almost entirely, and presented the appearances of perfect health. Repeated examinations of his morning sputa failed to detect in them a single bacillus; a physical examination of his chest showed that the consolidation at his left apex had disappeared. For five months he had breathed an optically pure air, and either that had acted as a germicide upon the bacilli in the diseased lung or the consequent improvement in his nutritive processes and the greater vigor of his general system had so changed the diseased processes in his lungs that the fitting soil for their development no longer existed.

Case II.—A young man, nineteen years of age, with no hereditary phthisical tendencies, in March, 1883, had a profuse hæmoptysis immediately following a long ride on horseback; he soon began to cough, and lost flesh and strength rapidly. On the 6th of the following May he came under my observation, when he presented a well-marked phthisical aspect, and had occasional night-sweats, with a temperature ranging from 102° to 103° in the afternoon. A physical examination of his chest revealed consolidation of the upper third of his left lung, with numerous small-sized moist râles and pleuritic crepitations. His sputum, which was abundant, contained large numbers of tubercle bacilli. I directed him to remain in bed, and placed him exclusively on a milk diet for three weeks, at the end of which time his fever and sweats had left him, and, at his earnest request, I allowed him to take a steamer for Europe. He reached Davos the last of June. Within two weeks after his arrival at Davos he had two profuse hæmorrhages. During most of the summer he was extremely weak and short of breath on the slightest exertion, with an exhausting cough, accompanied by a profuse expectoration. In September he began slowly to improve; his improvement was continuous and not attended by relapses, as is usual in such cases. During the latter part of winter, or in the early spring, his cough left him, except in the morning on rising; he had regained his usual weight, had a good appetite, felt perfectly well, and could take long walks without fatigue. He remained in Davos during the next summer. In September he was told by his medical attendant at Davos that he might return to New York. Soon after his arrival home I examined him. All evidence of consolidation at his left apex had disappeared, and the only remaining physical evidences of his former disease were thickening of the pleura and a few bronchial râles at the left apex on coughing. On examination of a number of specimens of sputa, obtained immediately after rising in the morning, no bacilli could be detected. In January he began to cough again, lost flesh and strength, his expectoration became profuse and again contained bacilli, the physical signs of infiltration again appeared at the site of his old trouble, and he immediately left for Los Angeles, where I understand he is quite well. This history seems to indicate that the presence of tubercle bacilli in the sputum is ultimately connected with, or markedly influenced by, breathing an impure and dust-laden atmosphere, while their disappearance was effected or intimately connected with breathing a pure atmosphere, for the physical signs, when the patient returned from Davos, evidenced that the phthisical processes in his lung, although not progressive, still existed, and bacilli should have been present in his sputa.

If, then, we accept as trustworthy the views and statements of recent observers in regard to the ætiology and morbid anatomy of phthisis, it seems evident that its prophylaxis and rational treatment are very likely to be in the future very nearly what they are now,

although we may give new interpretations to many of the agents which we are now employing.

In conclusion, gentlemen, permit me to urge upon you to be careful how you send phthisical patients from home while the disease is in active progress. During the period when there is active febrile disturbance most patients are best cared for at home. Always wait for a period of quiescence, which will certainly come in all cases of chronic phthisis during its first stage, before sending your patients far from home.

There is a tendency at the present day to send phthisical patients from home before sufficient time has elapsed to form any reliable opinion as to the probable course of the disease. I believe it is better—certainly it is safer—at first to keep our patients near us, where they can be more or less directly under observation. There are health stations near at hand, where most of the conditions exist which are known to exercise a favorable influence on phthisical processes, and it is far better to utilize these for a few months before sending patients to the more distant and, perhaps, more valuable ones. *Never send patients in the advanced stage of phthisis, if the disease is in active progress, far from home to seek health.* Let me also urge upon you the importance of keeping phthisical patients in the localities where they improve until they reach complete recovery. The practice which is followed by many medical advisers of sending their patients to one place in the summer, another in the winter, a third in the spring, and often a fourth in the autumn, I believe is most injurious; nor can I find any good reason to justify these successive changes.

An intelligent gentleman in the last stages of phthisis once said to me: "In attempting to follow the seasons I have traveled more than 2,000 miles each year, and the result, as you see, is a failure." These unhappy patients, urged by a hope born of despair and by the tyranny of a physician's order, wander from one health station to another. Scarcely do they begin to experience the beneficial effects of rest in a climate in which they are improving when the requirement of change, in correspondence with the season, drives them to another, and they are compelled again to begin the dangerous work of acclimatization. Thus they are always moving from one health station to another, stimulated by promises which can never be realized, and often die by the way-side, far from home and friends.

Paper.

ANTISEPTIC INHALATIONS.

By BEVERLEY ROBINSON, M. D.

IN a paper read before the Practitioners' Society of New York last winter, "On the Utility of Intra-pulmonary Injections in the Treatment of Pulmonary Phthisis," I said that I intended at an early date to bring before my medical colleagues the subject of antiseptic inhalations. In the brief paper I now offer for your consideration I shall do this, but I shall not limit myself solely to the consideration of the advantages of these inhalations in pulmonary phthisis. Already I have made use of them in several affections of the respiratory tract —both acute and chronic. Although the cases treated by me in this manner are not yet numerous enough to afford a solid basis for final conclusions, they are at least sufficient to point distinctly to an extensive and beneficial trial of this method in a large class of respiratory diseases. The method is not new, it is old; but it is also a case of revival, with more precise data to establish its special indications and employment. To any one who has made frequent use of steam vapor inhalations, and hot or cold atomized fluids or sprays, the great advantages of the plan which forms the theme of this study, in the treatment of the affections referred to, is too real to be lightly considered or entirely ignored.

In its favor may be cited the following propositions:

1. The apparatus required costs but a trifle, and may be used, therefore, even by the poorest classes.

2. Medication thus applied may be employed under circumstances where the use of hot or cold sprays is impracticable.

3. There are no risks of future colds attendant upon its employment.

4. The relief afforded by dry vapor inhalations is, in my experience, frequently greater than that given by the other methods of inhalation.

5. This medication is well adapted to all forms of irritative disease of the respiratory passages.

I know of only one serious objection which can be properly urged against its very general adoption, and it is the statement that the vapors of volatile antiseptic substances, when they are employed in the ordinary oro-nasal inhaler, do not penetrate far enough to reach

the pulmonary cells, and, therefore, can not possibly modify this structure in any sensible degree.

Upon experimental grounds, Arthur Hill Hassall ("Lancet," May 5, 1883) has endeavored to show that the agents most frequently employed hitherto—such as carbolic acid, creasote, thymol, etc.—are but feebly volatile at ordinary temperatures. He has also been unable, after prolonged inhalation, to recover any notable quantity of these substances in the sputa or secretions from the air-tract. In fact, he has not even remarked that the sputa, soon after they were expectorated, were penetrated with their odor. Indeed, after continuous inhalations of one or two hours' duration, he has succeeded in obtaining, by Chandelon's process, from the sponge or cotton in the inhaler, very nearly the whole quantity of the agent employed. A sufficient answer to these objections, it seems to me, may be found in the fact that the patients themselves, when questioned, after they have used the inhalations during a few days or weeks, as to their utility, almost invariably reply that their subjective symptoms have been notably relieved by them. Not only do they make this statement, but they add, further, that their sputa have diminished in quantity, and at times have notably changed in appearance. Moreover, while I am willing to admit that dry vapors do not enter the lungs so deeply as we might presume, or indeed as, theoretically, we might desire, yet they certainly do go further than the sprays for which they have been substituted. I am of the opinion, also, that the small loss of substance which has not been recovered, and which *possibly* does penetrate the pulmonary air-cells, is sufficient to modify notably, after several days or weeks of more or less continuous inhalation, the inspired air in such a manner that it is made comparatively aseptic, and thus we have an influence for good that we can properly estimate only by the evident effects produced. In regard to the areas of cough in the bronchial tubes, as in the lung itself, I believe something may be learned by reference, first, to my own experiments with intra-pulmonary injections, and, second, to the well-known facts recorded by Hack and J. N. Mackenzie in their investigations upon the nasal passages. In my experiments I was led to believe that *pulmonary cough* was largely due to irritation produced at the apices. And surely this conviction need not be a matter of surprise, since we all know that the sensitive area for cough in another organ (the nose), physiologically allied to the lungs, is not general, but limited almost to the posterior extremities of the turbinated bodies.

Again, is it not true that, in many cases where there is notable effusion into the air-cells at the pulmonary bases, as in œdema following chronic Bright's disease or organic heart disorders, there is usually little or no cough? Whenever, on the contrary, as in commencing bronchitis or phthisical infiltration, there are obvious morbid changes at the apices, what more obstinate and constant symptom can be observed than the ceaseless racking cough? Finally, I have on more than one occasion, I am confident, punctured the lung deeply in searching for pleuritic fluid, either posteriorly or in the axillary line, as was evident by the blood and air withdrawn into the cylinder of the hypodermic syringe, or into the pump of the aspirator, and cough has not followed invariably. This fact is, however, also true in regard to punctures at the pulmonary apices; but here the intra-pulmonary alterations have been very different from what existed at the bases at the time punctures were there made. In the former cases the lungs were already infiltrated with tubercles which blocked up the bronchi and surrounded their periphery; in the latter cases the bronchial tubes were inflamed or compressed, it is true, but were not, as a rule, completely impervious to air. Mucus and serum, blood-streaked or not, they usually contained, no doubt, but even then their condition was such as to render them *a priori* more sensitive than they should be under wholly normal circumstances.

I will now place before you some of the results of my trials with dry vapor inhalations up to the present time, and if, by their analysis, I can prove the utility of this method clinically, I shall hope to stimulate further inquiry, and persuade many of you to give it the opportunity which, I believe, it merits. It is understood, I assume, that I do not claim any originality for the treatment of my cases. These dry inhalations were reintroduced to the profession, as you are all aware, some years ago by Dr. W. Roberts, of Manchester, England, and since that time have been more or less extensively employed by H. Curschmann, of Hamburg, and by several other able practitioners at home and abroad. Among these I would cite particularly William Pepper, in the "Transactions of the American Medical Association" for 1880; J. H. Tyndale, New York "Medical Record," March 18, 1882; J. Burney Yeo, in his "Lectures on Consumption," London, 1882; S. S. Cohen, in Philadelphia "Medical News," October 11, 1884; J. Ward Cousins, "Lancet," July 19, 1884; and A. Hill Hassall, "Lancet," August 16, 1884, and "Inhalation Treatment," London, 1885.

The following summary shows the number and nature of the cases of which I have preserved notes, but does not represent one half the number of patients for whom I have ordered oro-nasal inhalers. I regret to add that, even in those cases of which I possess a record, several were not studied with much care, and, consequently, my remembrance of the results obtained is very imperfect. A sufficient number remain, fortunately, in which I have watched carefully the effects of dry inhalations, and about whose condition, before and after their use, I can speak with more assurance.

My tabular statement includes twenty-two cases of phthisis pulmonalis, catarrhal or tubercular, at its first stage, or when already there were evident and characteristic signs of tissue infiltration.

In four of these cases there were marked local pleuritic adhesions. In the remaining cases no statement is made other than the fact that pulmonary consolidation at the apex or apices was present.

Nineteen cases of pulmonary phthisis, catarrhal or tubercular, at its second stage, were treated partly by means of oro-nasal inhalers. Of these nineteen cases, in eleven the softening was limited to one apex; in two cases both apices were thus affected, while in the other cases no reference is made to the limitations of the disease. There were six cases of fibroid phthisis treated by inhalers; three cases of laryngeal phthisis, in one of which there was commencing carious ulceration of the vocal cords. There were two cases of acute laryngitis, seven cases of subacute laryngitis, three cases of chronic laryngitis, two cases of subacute bronchitis, three cases of chronic bronchitis, five cases of chronic nasal catarrh, four of which were of the hypertrophic form, the remaining one being distinctly atrophic catarrh, with which were connected a condition of pharyngitis sicca and a notable degree of fœtid odor of the breath (ozæna). I also treated in this manner one case of chronic pharyngitis, two cases of localized pleuritis, and one of paralysis of the tensors of the vocal cords—the total making *seventy-six* cases which form the basis of the remarks I shall make before you to-day.

First, in regard to pulmonary phthisis at its first stage. Of this disease I have the records of twenty-two cases in which I used dry vapors. The inhalations consisted of, 1, creasote and alcohol equal parts; 2, creasote one part, ol. pini sylvestris two parts, and compound tincture of benzoin eight parts; 3, compound tincture of benzoin; 4, fir-wood oil; 5, fir-wood oil sixteen parts, creasote one part; 6, fir-wood oil six parts, chloroform two parts; 7, creasote one part, fir-wood oil sixteen parts; 8, compound tincture of benzoin and fir-

wood oil, equal parts; 9, spirits of turpentine; 10, volatile oil of eucalyptus; 11, carbolic acid and tincture of iodine, of each one part, compound tincture of benzoin eight parts; 12, fir-wood oil one part, succus conii and compound tincture of benzoin, of each two parts, carbonate of magnesium, q. s., water eight parts; 13, pine-needle oil; 14, terebene four parts, spirits of chloroform one part.

It will be remarked that I varied considerably the nature and composition of the substances employed for inhalations—and this is specially notable if the limited number of my cases be considered. I made these trials advisedly, as I was very desirous to find out not only if vapor inhalations were useful, but, indeed, if certain combinations were more effective than others under similar conditions.

The results of my observations would seem to show that the most generally useful inhalation in the beginning of pulmonary phthisis is creasote and alcohol, equal parts. Creasote by itself is a little too irritant, and is not so readily manipulated. Whether or not the mixture of alcohol increases its volatility I am not positive, although I believe it does, regard being paid to the statements of patients. The amount of inhaling fluid employed with best results varied from ten to twenty drops. It was also renewed most advantageously two or three times in twenty-four hours. The inhalations were employed at first about ten minutes every two, three, or four hours. After a week or two they could be continued, without unpleasant effects, one half or one hour at a time, and repeated three or four times in twenty-four hours. If a larger quantity of the inhaling fluid was used at first on the sponge of the inhaler, or if at first the time for each inhalation was extended beyond fifteen minutes, the patient suffered from irritation of the throat and increased painful cough on several occasions. The form of inhaler employed by me was usually one not dissimilar in outward conformation to that employed by Burney Yeo, of London, and S. S. Cohen, of Philadelphia. It may be of interest in this connection to give a short account of the different oro-nasal inhalers in use at the present time. Some of these are shaped so as to cover the mouth alone, some are adapted simply to inhalation through the nose, and some encircle both nose and mouth. They are made of metal, hard rubber, or celluloid, and are usually constructed from a single sheet of the material employed, their particular shape being made to suit the requirements of the majority of individuals. In Blake's and Tyndale's inhalers, which cover both nose and mouth, there is a circular valvular opening on either side, about one third of an inch in diameter, which closes by

means of a soft rubber flap that rises or falls with each inspiration or expiration, and is intended to promote the facility of expiration and to avoid the passage of respired air through the sponge charged with the inhaling fluid. In Hassall's oro-nasal globe inhaler similar valvular openings on the sides have been provided, and this inhaler has the additional advantage, as stated by its inventor, of supplying a larger amount of medicated vapor to the patient for purposes of inhalation. This result is effected by reason of the considerable capacity of the globe itself for containing bits of lint moistened with a suitable amount of inhaling fluid, and owing to the wider orifice of communication between the globe and the oro-nasal piece, or shield, which allows plenty of medicated vapor to pass through and be inhaled with each inspiration. When an inhaler is fitted to the nose alone, it is better, as a rule, for the patient to expire through the mouth than through the nose, as in this way a more complete circuit of the nasal passages by the vapor is accomplished than if expiration took place through the nose. None of the inhalers described, although somewhat more elaborate and expensive, seem to me so useful as the cheap and simple one here shown. This one, as you perceive, is made of a thin sheet of perforated zinc; it is extremely light, and may be worn, therefore, a long time without causing the fatigue to the patient which the other inhalers often do. It also permits the air to pass freely in and out, and thus obviates almost entirely the sensation of oppression and stifling, which is apt to make the prolonged use of the other oro-nasal inhalers almost impossible.

One of the objections urged against the efficacy of most oro-nasal inhalers is the fact that too small a supply of vapor is given off from the small bit of sponge, cotton, or tow which comes with them to be of any benefit to the patient. In the globe inhaler Dr. Hassall has remedied this supposed defect. For my part, I have not usually found it a defect, and I have rarely found the slightest difficulty in supplying my patients, by means of the perforated zinc inhaler, with all the medicated vapor they could comfortably endure. Indeed, I have observed several times, as other observers have done before me, that the quantity of antiseptic liquid added to the sponge of the inhaler must be limited to a few drops (10 to 20) if the inhaler is worn more than a short time. If a relatively large quantity of antiseptic fluid be added to the sponge, the vapors proceeding from it are too concentrated and shortly become very irritating to the air-passages, and the inhaler must be abandoned. Instead of doing

good, therefore, by adopting the latter manner of medicating the sponge of the inhaler, we actually do harm and render a very serviceable agent a decidedly objectionable one. I am therefore not of the opinion of Dr. Hassall as regards this point in inhalation—viz., that with the ordinary forms of oro-nasal inhalers we do not volatilize a sufficient quantity of antiseptic fluid to be of service as an inhalant; and even when we volatilize enough fluid not enough antiseptic vapor is inhaled to modify the air-cells to any notable degree.

In my first trials of antiseptic inhalations I made use of Kinnicutt's inhaler, which, I believe, was patterned after that of Roberts. The inhaler I now employ is slightly modified by Ford from Yeo's inhaler, so that the sponge is held by two folds of the perforated zinc-wall, instead of by strings which originally held it in place. I believe the inhaler, as I am now using it, could be perfected in the following ways: 1. The holes in the zinc-plate to be made larger, and thus allow the air to pass through the sponge more freely. 2. The posterior half of the inhaler *not* to be perforated at all, but to consist of one uniform piece on either side. In this way there would be a stronger direct current through the sponge with each inspiratory effort of the person inhaling. 3. A double-valve arrangement, to be placed so as to allow the vapor to pass from the sponge into the respiratory tract during inspiration, and also to permit the expired air to pass directly out from the inhaler without repassing through the sponge. With these modifications properly made, I am satisfied, in certain cases, that the inhaler could be worn almost continuously day and night, and sometimes with great benefit to the patient. The general treatment followed by my phthisical patients was: 1. Malt and cod-liver oil. 2. Compound syrup of the hypophosphites. 3. Iron and arsenic. To the use of one of these mixtures, stimulants, powdered meat, digitalis, and quinine were occasionally added. Counter-irritation by means of iodine, Corson's paint (iodine, croton-oil, and ether), or fly-blisters, was made whenever it seemed indicated. In many cases one of these treatments had already been faithfully carried out before the patients came under my care, and ordinarily, I regret to add, with anything but promising results, in so far, at least, as the rational symptoms of disease were concerned. Of course, with respect to the physical conditions of the lungs previous to the time when I first saw them I could only form a probable judgment, and I inferred simply that as the symptoms of disease had not notably improved, so the alterations of structure had doubt-

less not retrograded to any marked degree. In more than one of my patients the inhalation used (fir-wood oil, combined or not with chloroform) eased the throat for a long while after using it. In spite of this ease to the throat, the cough was not always arrested; still, the inhalation gave a sort of renewed vigor, and the patient felt decidedly cheered and encouraged. Sometimes the inhalation brings on cough, but not even then does it appear to irritate the throat. Usually the expectoration was rendered much easier; it decreased often in quantity, and, consequently, there was less cough. While using the inhaler one of my patients had a slight hæmorrhage, and was disposed to believe at first that the inhalation occasioned it. Later, and in this same patient, the inhalation (creasote and alcohol) caused no irritation whatever of the throat, and was worn one hour at a time, and about three or four hours in the twenty-four. One patient notably gained several pounds in weight while using the inhaler, and stated that he felt stronger and better in every way than he had previously. When the inhaler was kept on too long, and in those patients who had functional disturbance already of the stomach, nausea was occasioned. No inhaling substance reduced the quantity of sputa to the same extent as turpentine, but this liquid was apt to cause dryness and irritation of the throat, and was frequently replaced on these accounts by creasote and alcohol. Not only were the sputa diminished, as a rule, by inhalation, but several times they showed manifest changes of color. They also became decidedly less thick and viscid, and, from being green-looking and tenacious, they soon were foamy, like soap-suds, and thinner, or showed the aspect of mingled mucus and pus. The breathing was also improved on many occasions, and the patient could make more exertion without becoming flushed and exhausted, or pale and panting. At times the improvement of breathing, of cough, in the amount and character of the sputa, in the appetite, in strength and feeling of more lightness and vigor, was accompanied by physical changes which seemed to indicate improvement in the local condition at the apex, or apices. In one instance, for example, I made a note to the effect (and after three months' use of the inhaler) that the pleuritic râles which had previously existed at one apex during ordinary respiration had completely disappeared, and the breath-sounds had otherwise improved. In other words, they had become more vesicular and less harsh, and the expiratory murmur less prolonged.

Owing to the diminution of cough and the decrease in the

abundance of the sputa, the patient's sleep was not so much disturbed—and thus I have found the use of the inhaler during the evening, and even at bed-time, was evidently a greater promoter of rest than cough-mixtures or anodynes. This was true even when direct examination with the mirror had shown that the larynx was red, swollen, and inflamed, as indeed evidences were already present of incipient laryngeal phthisis. One of these patients stated in emphatic terms that, although she had taken all sorts of drugs for her cough, none of them helped her so much as the inhalation. I would not have my hearers misunderstand me and believe I am of the opinion that in the oro-nasal inhaler we have a panacea for *cough* and other distressing symptoms of phthisis at the first stage. Frequently patients will do well for a time with one kind of inhalation, and we shall feel greatly encouraged; and then, through some exposure or imprudence, or indeed by reason of the steady onward march of the disease, the cough again grows worse and other annoying symptoms return with full force—again and again to be relieved by some new form or combination of inhalation. In one case I employed at different times and during many weeks, extending in all over several months, the following inhalations: At first, inhalations of eucalyptus, then of carbolic acid, iodine and benzoin, later of creasote and alcohol, and finally of fir-wood oil, conium, and benzoin. Each one of these relieved for a time, and afterward lost its beneficial, soothing effect. Still, everything considered, I concluded I had a means which, contrary to Hassall's opinion, was powerful for good, and, despite regrettable failures, was more useful in many instances than steam inhalations or atomized fluids. In not a single instance was I satisfied that the metallic inhaler, when properly employed—and by this I mean when the quantity of fluid poured upon the sponge and the duration and frequency of the inhalation were judiciously regulated—increased the cough except in a very temporary manner, or was productive of any evident bad results. What I have written in regard to the effects of inhalation of vapors of antiseptic fluids in pulmonary phthisis at its first stage is almost, if not equally, true of phthisis at its second stage, and when the pulmonary apices give undisputable signs of softening and breaking down. Even under these circumstances cough becomes less, expectoration is soon more fluid, and, in consequence, more readily raised, and the patients speak of diminished difficulty of breathing and improved rest and sleep at night. In my cases of fibroid phthisis the patients, after a few weeks' use of the inhaler, felt

much improved. They could use the inhaler half an hour to an hour at a time, and several times a day, without inconvenience, and stated that they thought the inhalations helped their cough very much. In these cases, also, the sputa diminished notably in quantity and became more frothy, and lost in great part their viscid character. From my limited experience with these cases, I am inclined to believe the fir-wood oil is more useful as an inhalation than any other liquid employed by me.

In laryngeal phthisis the cough in one instance was more frequent and troublesome at first; later it seemed to improve. Certainly the expectoration was looser, although more abundant, and no unpleasant sensations were experienced while inhaling. In one instance the patient increased several pounds in weight while under treatment by means of antiseptic inhalations. No visible changes in the intralaryngeal condition were noted, although repeated examinations were made with the mirror to detect, if possible, such modifications. The inhalation employed in these cases was a combination of one part of fir-wood oil with four parts of tincture of benzoin. A point to which I desire to direct attention in regard to the use of all inhalations is this: Frequently inhalations are useful in allaying cough and the symptoms dependent upon it, even though it is evident that the inhalation does not penetrate below, or even so far as, the larynx. This fact may be explained in two ways: First, as is well known, the cough may in reality be occasioned by a morbid condition in some part of the respiratory tract, preceding the lungs in location, and although the lungs or bronchial tubes may also be inflamed. This morbid condition may be an elongated uvula, post-nasal catarrh, follicular disease of the pharynx, acute or subacute laryngitis, etc. Again, in the use of all forms of inhalation, while the soothing and modifying effects of it are partly due to their direct local application, still there are similar effects produced by their absorption by and elimination through the mucous membrane lining the parts referred to. A final question in regard to phthisis and antiseptic inhalations should here be mentioned. Do they destroy the *Bacillus tuberculosis*, or do they affect notably its growth or vitality? *Personally*, I have never searched for tubercle bacilli after the oro-nasal inhaler had been worn a considerable time, and in which, previous to wearing it, these characteristic micro-organisms had been found. In one case, however, a careful microscopic examination of sputa was made by my house physician when the patient was known to have evident pulmonary phthisis as shown by indisputable physical signs. At the

time the bacilli were first discovered, inhalation of antiseptic vapors had not been employed. Several months later, and when during the intervening period a metallic inhaler had been worn during several hours each day, a second microscopic examination of the sputa was made and still showed a large number of bacilli. The precise relative number of these organisms observed on each occasion is not mentioned in the history of the patient, nor is it stated whether there was any proof to show that the bacilli had less vigor than when first detected. What is known definitely is this, viz.: that, although bacilli were present in considerable numbers at the time of the second microscopic examination, the patient herself, both as regards her physical condition and her rational symptoms, had evidently much improved. How much the improvement was directly due to the use of continuous inhalations it was impossible to affirm positively. There was no doubt, however, as to the fact that they had been useful and comforting in allaying cough, diminishing faucial irritability, and promoting the ease of expectoration.

If other observers be consulted, I am not aware that, up to the time of writing, anything more definite can be obtained in regard to the mortuary effects of inhalation on tubercle bacilli than what I have stated.

Whether or not, therefore, dry-vapor inhalations in concentrated form are able to destroy tubercle bacilli is not yet satisfactorily determined. That they are powerful to arrest or prevent fermentative and putrefactive changes of the sputa; that they can modify the terminal bronchi and lung-cells so that they will secrete less purulent matter for expectoration—so much at least results from direct clinical observation and experience. It is also highly probable that continuous dry antiseptic inhalations are able to weaken and partly devitalize the infective germs upon which the origin and growth of pulmonary phthisis largely depend, according to the present state of our knowledge. The manner in which this is accomplished is apparently either by direct action upon these organisms or indirectly by rendering their surroundings and the location where they are deposited very unfavorable to their extension or propagation. It is perhaps true, and it is certainly conceivable—by reason of analogy with other means by which some organic germs are killed—that such an effect may be produced by prolonged or frequent inhalations of antiseptic volatile agents of moderate concentration, as well as by shorter inhalations of very strong vapors. This is a most fortunate circumstance, since it is proved that the continuous inhalation

of concentrated vapors of antiseptic substances, in any notable quantity, is rendered impossible by the intolerance of the respiratory mucous membrane to their contact.

The power such inhalations may have will depend, in my opinion, upon several distinct factors: 1. Upon the form and efficacy of the inhaler itself. 2. Upon the substance which is used and its strength. 3. Upon the frequency and less or greater continuance of the inhalations. 4. Upon the stage which the pulmonary phthisis has reached, upon hereditary influences, hygienic surroundings, and individual vigor of constitution.

Having already taken up much of your time and attention, I shall be brief in my remarks about my other cases. In fact, I do not consider those in regard to which I have preserved notes as sufficiently numerous to warrant any strong affirmations. Still, as my memory serves me about several cases of each disease treated by inhalation, in some particulars at least, I trust that what I may say has more value than would be apparent but for this prefatory statement.

A. In *laryngitis*, acute and subacute, antiseptic inhalations are decidedly useful. They quiet irritation, lessen hoarseness, diminish cough, change the aspect of the inflamed mucous membrane, and, in certain cases at least, evidently hasten the disappearance of symptoms and the establishment of a cure. In one case, in which there were concomitant post-nasal catarrh, pharyngitis sicca, and paresis of the tensors of the vocal cords, producing hoarseness, there were also " a red, swollen epiglottis, arytenoid cartilages, and ventricular bands." In this case there was moderate cough. Still it persisted and caused much mental distress, despite various medications internally, and numerous local applications of pigments, sprays, and powders. One week after inhalation was begun the cough had disappeared completely. The larynx was less inflamed, the pharynx was not at all glazed, there were little or no frothy sputa, and, indeed, the patient was so far recovered that the remedy was stopped. This had consisted of ten drops of turpentine, used in Kinnicutt's inhaler, during five minutes every three hours.

B. In cases of *chronic nasal catarrh* the following effects were noted: A singer, having post-nasal catarrh, hypertrophy of the turbinated bodies, slight pharyngitis sicca, and catarrhal laryngitis, secondary to the other affections. This patient made use of inhalations of pine-needle oil, and soon remarked that these inhalations rendered the discharges from her nose, especially anteriorly, very

much less. The breathing also became notably freer. In fact, after two months' use of the inhaler, she had very slight trouble, if any, with her anterior nasal cavities. There still remained, however, some discharge from the naso-pharyngeal cavity. It is only fair to state that in this case, as well as in my other cases of catarrh of the nose, I made use, concomitantly, of other local treatment as an adjunct. Still, by comparison between the cases of nasal catarrh in which dry-vapor inhalations were employed and those in which these inhalations were not used, although other remedies were made use of, I believe that the inhalations were undoubtedly beneficial in the manner stated above. In three cases, in which marked dysphonia was obviously caused by the catarrhal inflammation of the nose, inhalations of benzoin and of benzoin and fir-wood oil produced marked benefit to the voice and general condition of the throat and nose. In one case, where the nasal duct had become obstructed by reason of pituitary hypertrophy, and there was consequent epiphora, this symptom, among others, was apparently relieved *in a measure* by inhalations, and the swollen membrane was reduced in thickness.

C. *In subacute and chronic bronchitis*, inhalations of tincture of benzoin and fir-wood oil—one part of the latter to eight parts of the former—after one or several weeks, diminished the cough, expectoration, and hoarseness. In one instance the patient stated distinctly that the cough was stopped by the inhalation. The amount of fluid used was 10 to 15 drops, one or more times during the day, and the inhalation was repeated ten minutes every three hours.

In a case of chronic dry pleuritis the first few inhalations produced cough, with expectoration. After a time the patient felt convinced that the inhalation was of benefit to him. "He coughs less now than formerly, and there is much less expectoration."

In one case of chronic laryngitis there was decided improvement after only a few days' treatment.

In my case of paralysis of the tensors of the vocal cords, and in one also of chronic pharyngitis, decided amelioration was shown after a time, owing to the use of the perforated metallic inhaler.

Discussion.

Dr. F. C. Shattuck, of Boston, said the paper confirmed him in certain views concerning antiseptic inhalations which were partly preconceived and partly based upon experience. Some years ago, when antiseptics first began to be used by inhalation, he administered them to certain patients. He found carbolic acid to be very disagreeable; it was difficult to induce patients to wear the inhaler containing it. He could not say

whether or not they were of any benefit, but perhaps he employed the inhalations too strong, and possibly under other circumstances the results would have been better. Certainly it was very desirable to get something which would simply allay cough. If by means of such simple remedies as these inhalations we could diminish cough and irritation, we should certainly do our patients a great service, and the service was no less if it enabled us to dispense, even only to a degree, with the use of opium. Dr. Hassall's book upon the subject of inhalations was a very interesting one, but his statement of the case seemed pretty strong. If one put a few drops of an antiseptic, say of carbolic acid, thymol, creasote, etc., on a sponge, and found at the end of two hours' inhalation that three quarters of the remedy could still be detected in the sponge, certainly the amount of the drug which could have effected an entrance into the lung must be very small. That, it would appear, was reasonable ground on which to distrust this method of treatment. Acting upon these observations, Dr. Hassall had constructed his inhalation chamber, and it would be interesting to see what would be the practical working of it.

Dr. Boardman Reed, of Atlantic City, inquired of Dr. Robinson whether he had used ether or cocaine by this method of inhalation. It had occurred to him that, inasmuch as these agents had been found so valuable in other directions, they might also prove valuable when inhaled in allaying cough, particularly laryngeal cough.

Dr. P. Kretzschmar, of Brooklyn, thought the tables referred to only went to show that there had been a change in the condition of the sputa after the use of the inhaler.

Dr. B. F. Westbrook, of Brooklyn, thought the benefit which Dr. Robinson had produced with this mode of treatment could be referred to two factors: First, the favorable influence upon the mucous membrane of the upper respiratory tract of an atmosphere kept constantly at the same temperature. This every one knew to be a very important matter in irritations of the respiratory apparatus. It was known that cough, especially when violent, almost always had its origin in the trachea or above it, although possibly in the bronchi, and a continuous supply of uniformly warm, moist air undoubtedly had a very soothing effect upon this part of the respiratory tract. Besides, balsamic vapors, which Dr. Robinson had employed, when inhaled even in very small quantities and for some time, had a very markedly soothing and beneficial effect upon the irritated membrane. It seemed to him that the allaying of the nasal and post-pharyngeal catarrh, the laryngitis, and the bronchitis, would account for all the good results which Dr. Robinson had observed. Anything which would give the consumptive rest would increase his appetite, improve sleep, and prove of benefit to his general bodily condition. Furthermore, Dr. Robinson had given his patients cod-liver oil, malt, and such agents as would improve general nutrition. Dr. Westbrook did not think that irritation at the apex of the lung would be more likely to produce cough than irritation of any other portion of the lung. At least he knew of no

proof of it. Dr. Robinson had mentioned congestion and œdema of the base of the lung as not being accompanied by cough, but it was also very well known that pneumonia of the apex was not accompanied by cough, while the withdrawal of a sufficient amount of pleuritic effusion to exert considerable influence upon the lung usually led to violent coughing. He therefore thought it hardly warrantable to say that irritation at the apex was peculiarly liable to produce cough.

The PRESIDENT (Dr. A. L. LOOMIS) remarked that the element of cough in phthisis was a very large one, particularly in the third stage, violent paroxysms occurring as the result of pleuritic adhesions. One often saw cases in which the only evidence of phthisis was the presence of fine crepitation at the apex or some other portion of the lung, and yet the patient was a sufferer from the most violent paroxysms of coughing, without there being apparent physical signs in the bronchial tubes or upper air-passages. His experience with inhalations had led him to believe that they were of use only so far as they acted as anodynes to the upper air-passages. He, perhaps, was prejudiced against their use, for his experience with them had been somewhat unfortunate. Their use had in a few instances been followed by profuse hæmorrhage. He would not say that the inhalations caused the hæmorrhages; he would only say that two or three cases, occurring at short intervals, had led him to be careful.

Dr. ROBINSON, in closing the discussion, said, in reply to Dr. Reed's question, that on one or more occasions he had used a small quantity of ether as an inhalation, either alone or combined with balsamic vapors, and he thought it produced some irritation, although it was very volatile. Certainly ether very generally produced more or less irritation, and it was but natural that it should do so in these conditions. He therefore preferred chloroform to ether. As to cocaine, he had not supposed that it would be of any benefit inhaled, and had not employed it. He had, of course, used it as a spray or with the brush in troubles of the respiratory tract. As to the susceptibility of the upper portion of the lung to irritation and the production of cough, of course he could not prove the point positively. He had concluded, from examination of the sputa in these cases, that they had come at least as far as from the lung structure, and, with the physical conditions present, it seemed fair to suppose that they came from the air-cells. It had been stated in the discussion that benefit from the inhalations was due to allaying irritation in the nasal cavities, larynx, pharynx, and trachea. He too thought that we should seek to know the real source of benefit derived from our treatment. He had only stated that in the use of inhalations we should, as far as possible and without causing undue irritation of the respiratory tract, make the air inhaled as pure as we could. That was what he had endeavored to do, and he had employed small quantities of the drug because large amounts caused irritation. If wealthy persons went to pine regions and to the Adirondacks in search of pure air, with the expectation of being benefited

thereby, it was but natural to suppose that the poor of New York city would be benefited by placing themselves in a condition approximating as nearly as possible the surroundings of such regions. While he agreed with the president that in a great many cases pleuritic adhesions might be the cause of cough in phthisis, yet his observation had not led him to believe that they occurred as frequently as many authorities had stated. He thought the irritation often centered in the lung itself, and was frequently allayed by favorable atmospheric conditions reaching the lungs themselves.

Paper.

CATARRHAL AFFECTIONS OF THE NASAL PASSAGES AS A CAUSE OF PULMONARY PHTHISIS, WITH SPECIAL REFERENCE TO THE QUESTION OF HEREDITY.

By WILLIAM CHAPMAN JARVIS, M. D.

THE ætiology of pulmonary tuberculosis, a subject always replete with interest to the clinical investigator, has naturally received a deeper significance since the discovery of the *Bacillus tuberculosis.* Despite, however, the positive character of Koch's results, there remains, according to his own admission, much yet to be learned concerning the prætubercular conditions which determine the development of the tubercle bacillus.* These conditions, variously and ofttimes vaguely referred to by such terms as tubercular disposition, predisposition, heredity, environment, etc., it would appear, are the principal avenues through which this momentous question, affecting the lives of so many thousands in our crowded city and elsewhere, is to be approached.

Several years ago, while studying the cause and complications of nasal diseases, my attention was attracted to the co-existence of bronchial with nasal catarrh, and somewhat later to the association of nasal disease with pulmonary phthisis.

These earlier impressions did not assume the shape of convictions until the reliable evidence I am about to present for your serious consideration was forthcoming.

In view of the light already thrown upon the question of the ætiology of tuberculosis through Koch's bacillary investigations, I have deemed it profitable to review some of the evidence he has offered us concerning the disposition and predisposition to phthisis.

As regards the question of the physical conditions favorable for the development of bacilli, we are informed by Koch that pent-up

* "Mittheilungen aus dem kaiserlichen Gesundheitsamte."

secretions, removal of the protective epithelia of the bronchi, abrasions, etc., are to be considered the proper soil—the "*geeignete Boden*" —for the lodgment and growth of the deadly tubercular plant. Now, these conditions will be recognized as the common results of catarrhal inflammation of the upper and lower air-passages. One or more of them are frequently observed in nasal catarrh, and may be also associated with catarrhal phthisis when taken in the popular sense of the term as taught to us by Dr. Alfred L. Loomis.

In certain cases we find pulmonary tuberculosis rapidly following in the train of a catarrhal bronchitis, while others will, apparently, resist the inroads of the bacillus for many years.

In treating my subject I shall begin with the nares and endeavor to distinctly trace the effects of nasal catarrh upon the larynx, and then in turn explain the relation of the resultant laryngeal disease to bronchial catarrh, catarrhal phthisis, and, finally, pulmonary tuberculosis.

The relations of the nostrils to the lungs is so intimate that we are not surprised to find Koch involuntarily addressing his attention to the nose for a partial solution at least of the question of the ætiological relations of the bacillus to pulmonary tuberculosis, with the remark, "Air inhaled through the nose is deprived of disease-germs, and nasal respiration, therefore, constitutes a positive protection against infection by reason of the retention of the infectious material by the nasal mucous membrane." Conspicuous among the complications traceable to nasal catarrh, and bearing upon the question of the causation of pulmonary phthisis, is *chronic irritative hyperæmia of the larynx.* I can not at present enter into a description of this affection, or fully explain how it is brought about by the entrance of nasal mucus into the larynx. I called especial attention to this condition in a paper read before the American Laryngological Association, session of 1881, to which I must refer you.*

This affection is usually observed as a peculiar red discoloration of the normally pearly white vocal cords, and, when found, constitutes an excellent guide for the determination of the amount of congestion of the general laryngeal mucous membrane. Chronic hyperæmia of the larynx frequently develops attacks of acute catarrhal laryngitis, and this affection in turn often involves the tracheal and bronchial mucous membrane by inflammatory extension. In other words, recognizing the larynx, with certain modifications, as the upper portion of the lungs, catarrhal inflammation of this organ clearly constitutes a

* "Archives of Laryngology," vol. iii, p. 148.

menace to the integrity of the entire pulmonary tract. The laryngoscopic study of the pathological processes concerned in the production of laryngeal hyperæmia and its common sequela—laryngitis—is, therefore, required to throw light upon the pulmonary diseases following in its wake.

Nasal stenosis and defective nasal drainage are the two most important indirect agents concerned in the production of this affection. The manner in which these intra-nasal disturbances lead to laryngeal and lung complications is principally by habitual mouth-breathing, the irritating action of nasal mucus in the larynx, and inflammatory extension from the posterior nares.

The part played by nasal mucus as an ætiological factor in the production of laryngeal and pulmonary disease is well pronounced and very important. The constancy with which chronic irritative hyperæmia of the larynx occurs as a result of chronic nasal catarrh encouraged me to make the statement that the simple discovery of this peculiar congestion was, as a rule, sufficient evidence of the existence of a chronic nasal catarrh.

The manner in which chronic hyperæmia of the larynx is induced through defective nasal drainage is exceedingly simple, and is best understood by carefully studying the direction of the several anatomical planes of the upper air-passages. I will refer you to a paper read by me before the New York Academy of Medicine, in which is given a detailed description of this system of drainage.*

I may simply state in passing that the disturbances to nasal drainage originating from a nasal catarrh prevent the natural disposition of nasal mucus, and, consequently, permit it to enter the larynx. Now, nasal mucus in the larynx is a foreign body, and as such invariably gives rise, by prolonged irritation, to a familiar train of signs and symptoms. Foremost among the signs stands, as I have already pointed out, chronic irritative hyperæmia of the larynx. The larynx naturally resents the invasion of its territory by irritating nasal discharges, and we have, as one of a number of *well-marked symptoms*, a constant inclination to "clear the throat." This act in itself may constitute an additional irritant by the rasping effect of the effort upon the vocal cords. The part played by habitual mouth-breathing as an excitant of laryngeal disease is simply that resulting from the absence of those conditions so essential for the purification and preparation of the respired air, and attributable to prolonged nasal stenosis.

* "Medical Record," March 14, 1885.

Having briefly presented the most conspicuous causes which serve to account for catarrhal disease in the larynx, the next step would naturally be to study the nasal complications responsible for the existence of the laryngeal affection.

Among these may be mentioned deviation of the nasal septum, turbinated hypertrophies, polypi, adenomata of the vault of the pharynx, etc. The proper consideration of either one of these conditions, taken alone, would cover many pages. I shall, therefore, be compelled to entirely omit the consideration of some, and only briefly accentuate those most commonly concerned in the production of laryngeal and pulmonary disease.

Hypertrophy of the turbinated tissues is an almost invariable concomitant of the moist forms of nasal catarrh. It may stand either alone or, as is commonly the case, exist as the result of a deviated septum. The co-existing mouth-breathing, hypersecretion, and disturbed nasal drainage will, of course, be governed by the location and amount of the turbinated hypertrophy. Passing promptly to the consideration of the second condition, the deviated septum, we are at once confronted by the most active and common agent concerned in the production of pulmonary and laryngeal disease. This condition differs from turbinated hypertrophy in being both a cause and result of catarrhal inflammation. Its existence, furthermore, implies the co-existence of a turbinated hypertrophy, barring, of course, recent traumatic deviations and extra-nasal distortions of the septum.* I have already had occasion to explain how a deviated septum, through *pressure irritation*, excites catarrhal inflammation.† Its action may be, to employ a homely example, compared to that of a shoe-button impacted in the nostril. The deviated cartilaginous spur, like this familiar foreign body, presses against the exceedingly sensitive surfaces of the turbinated tissues, invariably exciting and keeping up a certain amount of inflammatory action.

Thus we have a system of reciprocal irritation provoking and prolonging a nasal catarrh. For want of a better expression, I have called this *pressure irritation*, and I trust the term may recall to your mind the pathological process it indicates when employed in this paper.

The rôle played by the turbinated tissues and septum in the production of rhinitis hypertrophica was noted by me in a paper read before the American Laryngological Association, session of 1880;

* See "Archives of Laryngology," 1882, vol. iii, p. 300.

† *Ibid.*, vol. ii, p. 147.

and the ætiological relation of the nasal septum to diseased turbinated bodies was also satisfactorily demonstrated by Dr. Harrison Allen, though in a way differing from my own, in the same year.

Having determined the ætiological significance of the deviated septum in nasal catarrh, for a more detailed description of which I must refer you to my earlier papers on this subject. Another factor, which serves in turn to account for the deviated septum, requires a brief consideration—namely, heredity.

The term heredity, usually furnishing much material for uncertain speculation and little opportunity for satisfactory demonstration, has, in this connection, assumed a more definite meaning by reason of much corroborative testimony always at hand.

This evidence has convinced me that the deviated septum is frequently transmitted from parent to child.

In 1882, while engaged relieving the sufferings of a young woman, brought on by a congenital occlusion of the nares, my attention was attracted to an abnormal contraction of the superior maxillæ. In reporting the case I laid great stress upon the possibility of the chronic coryza and turbinated hypertrophies being associated with this condition as cause and effect.* Since that time, by careful investigation and comparison, I have been enabled to supply the necessary links in a chain of evidence which has demonstrated that one of the most common causes of catarrh is discoverable in the conformation of the hard palate. This peculiar malformation I find to be transmitted from parent to child with remarkable regularity, and its intelligent recognition and proper appreciation enables one to most satisfactorily account for a large number of catarrhal disturbances in the upper air-passages.

In these cases we find that the superior maxillary bones are not only contracted, but are likewise elevated, abnormally increasing the depth and diminishing the diameter of the roof of the mouth. The vertical measurement of the osseous nares is naturally more or less affected by the encroachment of the elevated hard palate, and the nasal septum, as a consequence, is bent laterally, as exemplified in the diagram, Fig. 1, A representing the normal septum and maxillary arch, and B the abnormal.

These plaster impressions, kindly presented to me by Dr. Eddy, nicely illustrate this peculiar palatine formation. They were selected from among thirty other plaster casts as the only two in which I could positively pronounce the existence of a chronic nasal catarrh.

* See "Archives of Laryngology," 1882, vol. iii, p. 108.

The doctor, on referring to the name of the subject, found that both belonged to the same individual—a patient he had referred to me

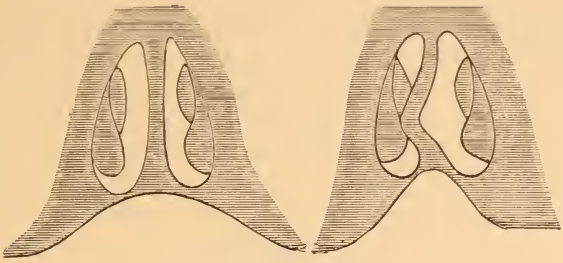

Fig. 1.

several years before for a severe chronic coryza, and the only one out of the whole number of casts. On comparing this plaster impression, Fig. 2, with the normal palatine arch, you will discern certain

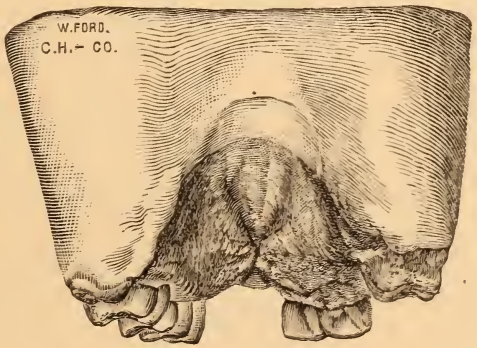

Fig. 2.

well-defined differences. The distance between the alveolar ridges is much greater in the normal specimen. The transverse diameter of the abnormal specimen is not only smaller, but its surface is markedly irregular. The maxillary arch may be considerably higher than this normal specimen, and yet not constitute a pathological condition. No two maxillary arches are exactly alike, and some exhibit an elevation easily mistaken for a deformity. The important distinction to bear in mind is the abrupt elevation along the line of the median rhaphé. When such a condition is observed, we may at once look for, and, in my experience, invariably discover, a corresponding deviation of the septum. This condition, furthermore, is found associated

with a chronic coryza. Indeed, I hold it to be possible in certain cases to diagnosticate the existence of a chronic nasal catarrh by the simple examination of the roof of the mouth, or, what amounts to the same thing, by inspecting an impression in wax or plaster, from any part of the world. After having ascertained the congenital character of this nasal abnormality, the next step was an endeavor to account for its existence. In tracing this peculiar formation to its hereditary origin, I was greatly assisted by instituting a comparative study of the external nose, and particularly the persistence of certain types in the same family.* By employing a similar method of reasoning to the internal configuration of the nares, I have been able to trace the peculiar conformation back to a common parental origin. This condition occurs as an hereditary manifestation with great constancy. Once the peculiar nasal type of the parents is recognized, its modifications in the children are easily determined.

It would appear that abnormal contraction of the nares is likely to be associated with intellectual enlargement of the skull in certain families, a fact which may serve to account for the tendency to phthisis attributed by some observers to severely studious or sedentary habits.

It is well known that a marked increase in the dimensions of the cranial dome is apt to be accompanied by a contraction of the osseous frame-work of the face. If it were convenient I might cite a number of interesting examples, carefully collected by me, to prove the correctness of this view.

Through Dr. L. J. B., referred to me by Dr. P. A. Morrow, my interest in the elevated arch and the septum of heredity received a fresh impulse.

Fig. 3 is a reproduction of the doctor's palatine profile. He creditably appreciated the significance of the high-pitched arch, and directed my attention to the peculiar formation of his own. The co-existing deviation of the septum was very well marked, and there were several other interesting features connected with this physician's condition.

I might mention, for instance, the unique occurrence, as far as I know, of a periodical perspiration over a circumscribed area, above the left malar prominence, and around the neighboring portion of the cheek.

There was an extensive *general* deviation of the septum to the

* "It is said by Ribot that, of all the features, the nose is the one which heredity preserves best."—"Hereditary Traits," Richard A. Proctor.

left, and it was fair to presume that this peculiar perspiratory anomaly was due to prolonged intra-nasal pressure exerted by the deflected structure.

The prompt disappearance of this annoying symptom after removal of the offending tissues confirmed the correctness of this view.

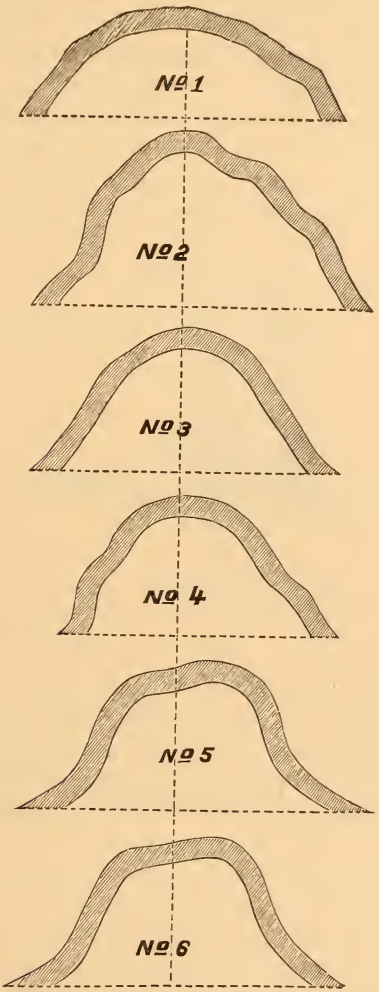

Fig. 3.

The doctor, although a life-long sufferer with nasal catarrh, was so much benefited by surgical treatment as to pronounce himself, in

certain respects, a different man. Free nasal respiration through the left nostril was, for the first time in his life, made possible.

The following extract from his family history is of interest as regards the question of heredity: His father, a physician now deceased, was all his life-time annoyed by a persistent coryza and throat trouble. On comparing the doctor's photograph with an oil-painting of his father, a resemblance in respect to the shape of the nose and forehead is sufficiently well marked to challenge the attention of even a casual observer. Furthermore, I ascertained, from a member of the family, that his grandfather, also a physician, looked like his father and was afflicted with a catarrhal affection.

I have selected from my case-book a few life-sketches, which will aid me in explaining what I mean by hereditary deviation of the septum. This, Fig. 4, was copied from the life-sketch of a boy, aged

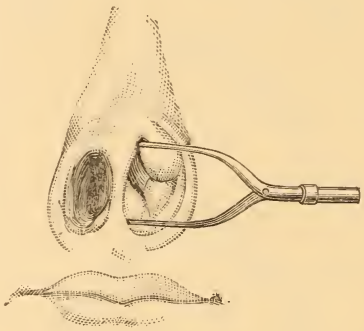

Fig. 4.

fourteen, referred to me by Dr. A. W. Berle, of New York, and the next drawing, Fig. 5, was taken from the father of the lad. The hard palates of both were markedly contracted and elevated. The father had bilateral deviation of the septum with life-long nasal catarrh, and the son was referred to me for relief from the same trouble.

A cross-section of the elevated and contracted hard palates is shown in Fig. 3, where No. 3 represents the father and No. 4 his son.

These tracings were obtained by taking a wax impression of the roof of the mouth, then reproducing the deformity in plaster of Paris, and dividing the casts thus obtained with a fine saw, in a transverse direction. The divided fragments were then simply laid upon a piece of paper and outlined.

You may be able to distinguish a slight resemblance in their

shape, when compared with each other, this similarity being rendered more distinct by their dissimilarity with the other arches.

An idea of their abnormal divergence from the true type may be obtained by comparing the two arches with No. 1, taken from a plaster cast exhibiting an unusually flattened and expanded hard palate, and selected as an extreme illustration of the kind.

Returning to the sketches (Fig. 4) you observe the cartilage of the son's septum is deviated to the left as a localized nodular projection, almost on a level with the floor of the nose.

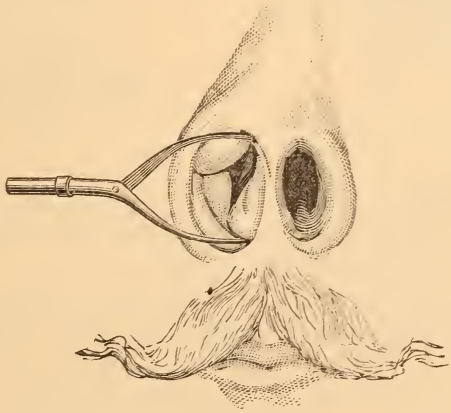

Fig. 5.

The father's septum (Fig. 5) was also thrown to the left, but, in the form of general deviation, situated superiorly in the nostril, the inferior-anterior edge of the septum being deflected into the right nostril in a manner similar to the son's.

It may be worth noting that when the lad was first brought to me I sought the hereditary origin of his deviated septum in the mother's nose, with a negative result; and yet, unwilling to be adjudged guilty of an erroneous conjecture, I persuaded the mother to induce her husband to visit me, and proved the correctness of my inferences as just described. The removal of the deviated cartilage from the boy's nostril was followed by an excellent result. This drawing (Fig. 6) shows the nose of a son aged twenty-two, and next to it (Fig. 7) that of the father. They are copied from life-sketches. You observe that both septa are *generally* deviated in the same direction. Both were severely afflicted with a life-long coryza.

Fig. 3, Nos. 5 and 6, exhibit transverse tracings of the father's and son's hard palates in the order mentioned. The point of highest elevation, it will be observed, is toward the nostrils into which the

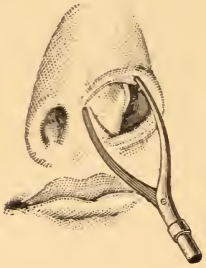

Fig. 6.

Fig. 7.

septa were deflected. The father, an old man, had become reconciled to his lot in life, although the extremely harassing character of his complaint made me marvel at this decision.

His bitter experience had the happy effect of making him alive to his son's life-interests. Directing our attention again to the sketches (Figs. 6 and 7), you observe the cartilage of the septum is conspicuously inclined to the left in both father and son. The father's septum (Fig. 7) exhibits, however, a greater degree of deflection, the respiratory space being reduced to a useless slit.

You may be able to distinguish a similarity in the shape of the external nose. The father, although a sufferer for many years with bronchitis and asthma, might be considered, under the circumstances, tolerably well developed and preserved. The son, on the contrary, also complaining of lung trouble, was stunted in stature, emaciated in appearance, with a haggard face and an unhealthy skin.

I operated upon the young man, removing two antero-inferior turbinated hypertrophies, and shaving off the septum for the whole length of the triangular cartilage, excising also a small portion of the anterior border of the vomer. Fig. 8, taken from a life-sketch, exhibits the left nostril after excision of the deviated structures. I employed my transfixion needles and écraseur for the removal of the redundant turbinated tissues, using my fenestrated cartilage forceps, tubular-spring forceps, and rongeur bone scissors for leveling the septum.

The subject of this illustration (Fig. 9) was afflicted with, and

cured by me of, an extensive osseo-cartilaginous deviation of the septum. The drawing was taken from a life-sketch, and the history of this individual throws much light upon the origin and

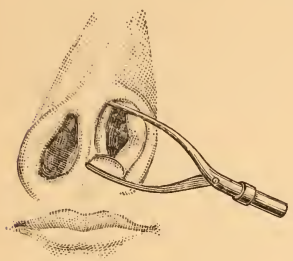

Fig. 8.

Fig. 9.

growth of the septum of heredity. You may catch my meaning when I inform you that I was enabled to correctly diagnosticate, or, more accurately speaking, infer, through this patient, the general condition of the nostrils and health of all his brothers, four in number, and his father. In this family the nasal asymmetry was very well marked, the septum in one instance being deviated to such an extent as to disturb the external symmetry of the nostril. All the young men seen by me, three in number, possessed the paternal nasal type and palatine arch in an exaggerated form. All have suffered with nasal catarrh dating far back in the memory of the family, and I am informed that the absent son, not yet examined by me, is severely afflicted with the same complaint. The patient, an engineer by profession and a very intelligent individual, referred to me by Dr. J. L. Corning, stated that a physician informed him that his condition was due to a scrofulous taint, probably inherited from his father. I failed to discover the slightest trace of scrofula in any of these individuals.

The cases I have just cited are not to be considered, as regards their immediate condition, phthisical in character; they have simply been submitted as excellent examples of the influence of heredity as a determining factor in the production of nasal disease, and as such must assist us in interpreting the same conditions when found in phthisis.

The testimony which I have just submitted, re-enforced by much more which I could, but can not now conveniently, offer, affords, to my manner of thinking, excellent proof of the intimate association of a high-pitched hard palate with a deviated septum, and their transmission from parent to child.

The relation of *traumatic deviation of the septum* to nasal catarrh and catarrhal phthisis is not so important as that of the hereditary variety; still it possesses many points of interest did time permit their consideration. Traumatic deviations of the septum, especially in those not predisposed to phthisis, are not likely to be followed by pulmonary tuberculosis. It should be borne in mind that the two conditions may be associated. The differentiation, however, as I shall have occasion to explain, is, as a rule, easily accomplished.

Although the cases of induced coryza just cited by me were of the hypertrophic variety, it should not be inferred that rhinitis atrophica may not be developed by the deviated septum.

Deviations determining the existence of atrophic coryza are *general* in character, and the dryness is evidently due to the excessive drain upon the mucous follicles resulting from the prolonged passage of air through a single nostril.

As an example of pulmonary phthisis following in the train of a rhinitis atrophica, I may be permitted, in an effort to make my meaning clearer, to precede my report of cases with a brief reference to a patient, aged thirty, treated by me at the University College Dispensary in the winter of 1882.* I found the nasal septum in this individual most extensively deflected, the deviation being osseo-cartilaginous in character. An atrophic rhinitis existed as a result of the nasal disease, both nasal chambers being inordinately enlarged through long-standing atrophic processes. Large and firm masses of muco-purulent matter clung to their smooth walls. These dry crusts were constantly detached and precipitated into the throat, irritating and inflaming the larynx. The patient was harassed and enfeebled by the unremitting efforts required to free his throat and larynx from these suffocating crusts. The atrophic processes had reached the pharynx, where, in the form of a pharyngitis sicca, it presented a dry patch, which obstructed the downward flow of the scanty nasal mucus, collecting it in the shape of sticky incrustations just behind the velum.

A laryngoscopic examination showed the true cords to be deeply injected and the contiguous structures inflamed by reason of the constant irritative action of the nasal incrustations which had found lodgment there.

The patient was extremely emaciated, weak, and miserable through the constant efforts required to free the throat from inspissated irri-

* See also No. I of illustrative cases.

tating discharges. There were night-sweats and the usual symptoms of advanced phthisis. An examination of his lungs, conducted by Dr. Moore, assistant to the Department of Medicine at the University Dispensary, and myself, revealed the existence of advanced destructive processes, as evidenced by the presence of cavities, a profusion of fine crepitant râles, and other familiar signs of the last stage of a rapidly progressing pulmonary phthisis. It was clear that the patient had reached a point where fatal prostration was imminent, and for an important reason we considered it best to advise him of his hopeless condition. Hoping to delay the fatal issue as much as possible, the patient found it convenient to accept the invitation of relatives in Florida, and so passed from under my observation.

The points of interest to us as regards this case, briefly summed up, are the history of a long-standing nasal catarrh and the manner in which it developed a pulmonary phthisis. That the nasal catarrh preceded the tubercular disease is proved by two features of the affection—namely, a deviated septum, osseo-cartilaginous in character, not associated with external nasal disfigurement, and therefore non-traumatic but hereditary, and a rhinitis atrophica.

Either of these pathological conditions would indicate the chronicity and persistency of the nasal catarrh, and therefore prove that they must have preceded the pulmonary disease; and in this, and in similar cases, we are afforded excellent evidence of the occurrence of the pulmonary lesion as a secondary complication to the catarrhal processes.

I will now direct your attention to the color of the mucous membrane of the upper air-passages as an indication of incipient or developed pulmonary phthisis. The color I refer to is a peculiar anæmic, pink hue, resembling that sometimes observed in hypertrophy of the tonsils. This pallor is by no means confined to the atrophic form of rhinitis, where, as far as the nostril is concerned, it invariably occurs, but exactly opposite to what we might expect is discoverable in rhinitis hypertrophica, where its presence should naturally lead one to suspect and find the anæmia of pulmonary phthisis. In two of the reported cases appended to this paper the condition was found in connection with a rhinitis hypertrophica; and in another, likewise phthisically inclined, it was associated with an hypertrophic and atrophic process in the same individual. I still favor the view advanced by me several years since, in an article on laryngeal phthisis,* that anæmia of the upper respiratory

* "Archives of Laryngology," vol. iv, p. 187.

mucous membranes influences the character of reparative changes, as exhibited, for instance, in the conversion of accidental abrasions in the larynx into phthisical ulcerations. It would seem to indicate diminished vitality or a lowered power of resistance. As an example, I might mention that my experience in operations upon the septum leads me to expect an exceedingly slow reparative process, and one usually requiring assistance in patients presenting marked anæmia of the septal mucous membrane.

In this class of cases, as we might naturally expect, the slight vascularity of the mucous membrane favors the action of the cocaine salts, and they are, in my experience, the only ones in which we can positively promise freedom from pain before operating.

I have selected a few histories from my case-book as good illustrations of the ætiological relations of nasal catarrh to pulmonary phthisis.

Case I.—Mr. ——, engineer, aged thirty, came to me for treatment in October, 1884. His complaint was a long-standing catarrh. The right nostril (Fig. 9) for respiratory purposes was practically useless, and had been so as far back as he could remember. Nasal respiration was, and had always been, carried on through the left nostril. Despite, however, the ease with which air was inspired through the free nostril, he had never been comfortable, on account of the respiratory obstruction referred to the narrow nostril, and eagerly utilized the smallest amount of space afforded at intervals by the temporary subsidence of the congested turbinated tissues. In addition to the respiratory discomfort, he was annoyed by the accumulation of inspissated mucus in the larger naris, and was wearied by the constant though ineffectual efforts employed to remove the ropy muco-purulent matter and offensive crusts. He was also tormented with the usual throat and laryngeal symptoms which occur as a result of the disturbances to nasal respiration and drainage. The slightest exposure was likely to be followed by obliteration of the insignificant respiratory aperture in the right naris, producing a disagreeable sense of tension in that nostril, evidently arising from the turbinated turgescence. The same exposure sometimes resulted in attacks of lung trouble, occasionally confining him to the house. In appearance he was thin and anæmic, his emaciation carrying with it more the impression of a peculiar build than an unusual or rapid loss of flesh. His appetite, though usually excellent, was capricious, and even at its best was not followed by any noticeable increase in weight.

Examination.—An examination of the nares anteriorly with my nasal speculum revealed the presence of just those conditions which would serve to account for the symptoms complained of. The vomer, ethmoid, and triangular cartilage projected to the right in the form of a *general* and easy incline from above downward. Anteriorly, however, the columna was displaced laterally to the right as an irregular knuckle of cartilage (see Fig. 10). No evidence of disfigurement of the external naris could be observed on ordinary inspection (another indication of the hereditary character of the complaint). An interesting feature observed upon the septum in the left nostril was a vertical elevation near the ethmo-vomerine suture, caused by the abrupt interruption of the perpendicular plate of the septum at this point. Behind this vertical ridge quantities of glairy or inspissated mucus would collect, and, by reason of the excessive breadth of the inner naris at this point, they would effectually elude the action of the respiratory pressure exerted by the patient to remove them. The turbinated structures and peri-turbinated mucous membrane was markedly atrophic in the larger or left nostril, but the inferior turbinated tissue in the right or narrow nostril was slightly hypertrophied. Just here we note an instructive example of cause and effect, for, as we might have expected, the life-long inspiration of air through a single nostril—unable, through secretory disturbances, to furnish the necessary amount of moisture—is naturally followed by desiccation and atrophy of the pituitary membrane. The right nostril, on the contrary, being almost completely stenosed, is always bathed in the nasal fluids. In other words, with certain modifications, it is a case of unequal distribution of respiratory labor with the natural consequence, a rhinitis atrophica and hypertrophica occurring in the same individual. The pharynx, larynx, and trachea presented the anæmia of phthisis. The patient's lungs were carefully examined by Dr. W. H. Katzenbach, of the Chest Department of Bellevue Hospital, and myself, and our suspicion was confirmed by the detection of the very early signs of pulmonary phthisis.

An interesting point in the patient's family history related to his brother, a physician, who, several years since, was threatened with a pulmonary phthisis and only escaped with his life by abandoning his labors and by careful treatment and systematic change of climate. It is easy to foresee the probable fate of the subject of this history under unfavorable circumstances, for there is every reason to believe that we have here an individual afflicted from child-

hood with a nasal disease due to a malformed septum, doubtless hereditary in character. I infer the hereditary character of the complaint from the peculiar form of the deviated septum already pointed out, from the fact that the brother and several ancestors of the patient were afflicted with pulmonary phthisis, and for other reasons already given.

Treatment.—Measures were at once employed to relieve the patient of the discomfort occasioned by the accumulation of mucopurulent matter and crusts in the ample interior of the right nostril. This was readily accomplished by thoroughly cleansing the nostril with warm detergent washes, and by the assiduous employment of the cotton probe. The naris, once renovated and relieved of all offending substances, was kept constantly clean by the daily employment of a convenient post-nasal douche, in the use of which the patient acquired much manual dexterity.

To prevent the adherence of nasal crusts to the sinuosities of the nostrils, the membrane was bathed at convenient intervals in a fine spray of vaseline. The douche became part of the patient's daily toilet, and he soon ceased to feel any discomfort except in the right nostril. A sense of oppression from his inability to breathe through this side increased his desire to obtain any relief offered by a surgical remedial measure. I therefore operated with this intent, leveling the deviated structure. This included a portion of the vomer as well as the deflected triangular cartilage. I employed my tubular forceps, fenestrated cartilage forceps, and rongeur or bone forceps. There were two sittings of about an hour each. The use of cocaine upon the patient was particularly satisfactory. A ten-percent. solution was applied in the form of a spray, and the parts in two or three minutes were so completely benumbed that bone and cartilage were crushed at short intervals without the slightest manifestation of pain. I have noticed a singular obtuseness to pain in other cases in which cocaine has been applied to an anæmic mucous membrane.

Fig. 10, taken from a life-sketch, shows the deviated septum anteriorly, and Fig. 11 the same after operating. Nasal respiration was completely re-established through the stenosed nostril, and this and the relief from other catarrhal complications left the patient in a most excellent condition—almost, in fact, unconscious of his trouble.

He embraced a good opportunity, and is now traveling abroad; on his return he will arrange to spend the winter farther south than New York. Under the favorable conditions afforded by physical

ease and a suitable climate the chances of this individual escaping the ravages of tubercular phthisis appear most excellent.

Fig. 10.

Case II.—Mr. ——, merchant, aged thirty-one, from Owego, N. Y., consulted me in January, 1884. The patient distinctly recollects having suffered with a nasal catarrh seven years ago. Al-

Fig. 11.

though the affection at that time proved troublesome, still the excellent state of his general health induced him to consider the malady as trifling and transient in character. Small quantities of phlegm were constantly hawked up from behind the palate. There was a disposition to clear the windpipe of particles of viscid matter. At that time and for several years subsequently he plowed the fields as a farmer.

The catarrhal symptoms, instead of disappearing, as he had hoped and expected, became more pronounced and troublesome, and, his stomach becoming incidentally involved, dyspepsia was added to his misery. The prolonged physical and mental discomfort resulting

from the persistent catarrhal disturbances ultimately sapped his energy and strength, rendering him unfit to pursue his usual occupations.

Clammy night-sweats commenced last summer, and have continued with varying frequency and severity since then. Becoming alarmed about himself, he was easily induced to seek medical advice.

Prominent among the symptoms given me at the first interview was a cough, which had, however, commenced only about a year ago. Phlegm was expectorated with the cough, particularly on rising in the morning. The cough, though annoying, was not painful. Six months ago only a pellicle of mucus was raised in coughing. There is now a disposition to draw flakes of mucus from behind the soft palate.

Examination.—General thickening of the nasal mucous membrane, post-inferior turbinated hypertrophy (dextra). The usual inflammatory redness of chronic hypertrophic coryza is replaced by the pale, anæmic hue peculiar to atrophic catarrh. The same pallor occurs upon the mucous membrane of the throat, larynx, and trachea. A livid, circumscribed, inflammatory process is visible upon the edge of the left true vocal cord.

Percussion furnished pronounced dullness over a large extent of the chest. The resonance on the right side was higher pitched than on the left. Auscultation demonstrated the presence of numerous fine crepitant râles diffused throughout the right lung and commencing in the left; also cog-wheel respiration, etc.

The patient, though feeble, was able to exercise in the open air and to visit my office. This, however, was in accordance with his own wish. Indeed, he seemed to dread nothing so much as confinement to the house—a natural feeling for one who has largely led an out-of-door life. The unusually cold and inclement February weather severely tried the patient's feeble powers of endurance, and with the decrease in his appetite and strength there was an increase in the copiousness and frequency of the night-sweats. I foresaw the patient's rapid decline under these unfavorable surroundings. He followed my advice and went South to escape the harsh wintry weather, and possibly to prolong his life a little. On the advent of the warm weather he returned, passing through New York on his way home. I then examined his chest and found that the fine râles had become generally diffused throughout both lungs. The patient safely reached home and died, near the middle of the summer, surrounded by his family.

Remarks.—The important and instructive features of this case are, first, *the history of a long-standing catarrhal affection* (of at least seven years' duration) *preceding any symptom referable to the lungs.* Although not holding myself in abeyance to the history of patients as given by themselves, still the exceptional intelligence displayed by this individual in relating his symptoms, and their agreement with the local findings, induces me to believe that *the nasal catarrh preceded the pulmonary disease.* In other words, in the combined constitutional depression and pulmonary irritation, resulting from the mental and physical wear and tear, respiratory disturbances, dyspepsia, etc., following in the train of a long-neglected nasal catarrh, we recognize the precursors of a fatal pulmonary tuberculosis. The peculiar blanching of the intra-nasal mucous membrane, and also of the pharynx and larynx, afforded additional evidence of the existence of a pulmonary phthisis secondary to a hypertrophic rhinitis. Such an appearance is just the opposite to what we might expect to find in this affection, and therefore indicates the anæmia of phthisis, for, although the catarrhal hyperæmia had entirely disappeared, its pre-existence is presumable from the presence of the more persistent products, namely, the intra-nasal hypertrophies.

The circumscribed congested area upon the right vocal cord probably resulted from the rasping character of the efforts constantly employed to clear the larynx of irritating mucus. Its very existence constituted an additional source of irritation, and, although not to be designated as an ulcer, it is highly probable that this abraded surface would have eventually proved to be the starting-point of a phthisical process, in accordance with a pathological process already described by me.*

Case III.—Mr. ——, aged fifty-three, from Ohio, came to me, through the recommendation of his son, a patient referred to me by Dr. M. J. Roberts, of New York, in quest of relief from an annoying nasal catarrh. The malady had existed for many years. Much discomfort was caused by the constant efforts required to remove a constant accumulation of thick, tenacious nasal mucus. Examination of the nostril revealed, among other signs of a rhinitis hypertrophica, the presence of an irregularly shaped posterior turbinated hypertrophy, occupying the right post-nasal fossa. The hypertrophy exhibited no signs of active congestion, but was dark-blue in

* "Archives of Laryngology," vol. iv, p. 187.

color, evidently indicating much passive engorgement of the turbinated venous sinuses. The nasal mucous membrane, throughout almost its entire extent, presented the pallid hue of phthisical anæmia. Exploration of the chest demonstrated the existence of catarrhal phthisis, most markedly developed at the apex of the right lung.

Believing the posterior hypertrophy to be responsible for much of the patient's discomfort, I concluded it best to remove this source of irritation. I employed my nasal écraseur, easily encircling the hypertrophied tissue with a loop of No. 5 piano-wire. As might naturally be anticipated from the blanched appearance of the pituitary membrane, the operation was a bloodless one. The patient pronounced himself much benefited by the operation and after-treatment, and returned to his home well satisfied. This was in January, 1881. In July, 1882, I was informed that he had caught cold and was carried off by an attack of pneumonia, thus confirming my suspicions that his pulmonary phthisis would eventually lead to his death.

The son of the deceased, a man about thirty years of age, had, as I have already indicated, consulted me for relief from a chronic coryza. The coryza, I discovered, was due to an hereditary malformation of the septum and nasal chamber. I succeeded in rendering him comparatively free from his complaint by removing the offending deviation of the septum. He has enjoyed excellent health ever since. It was interesting and instructive to note the close resemblance between the forehead and face of the father and son. The frontal prominences of both projected so far forward as to place the forehead almost on a vertical plane with the face. The face beneath the overhanging forehead appeared unnaturally narrow, affording an example of Blumenbach's observation of the marked retrocession and contraction of the bones of the face in individuals exhibiting great cranial development.

The father was an intelligent man, and his son, utilizing excellent educational opportunities, developed unusual literary ability as the editor of a journal. The youngest, and only other son of the family, about whom I was consulted but never saw, I am informed possessed a rare degree of intelligence, and have a right to suspect that he possessed the cranial conformation of his father and brother.

A few days ago I was informed that this son had just fallen a victim to consumption. Despite the discouraging family history of

the surviving son, I feel confident that *timely* treatment and care have sufficiently removed the impress of his unfortunate inheritance to enable him to live out his natural life.

Here, then, we have the mournful picture of a father, afflicted with a life-long catarrhal malady, eventually perishing with pulmonary tuberculosis, his eldest son harassed by a nasal catarrh traceable to a deviated septum, and another son, a young man, dying two years after the father with the same disease.

I might add other illustrations to the foregoing cases did not the typical character of those just reported make this unnecessary.

Treatment.—The treatment of these and similar cases is essentially one aimed at the direct cause of the disease—namely, the deviated septum and co-existing turbinated hypertrophies. It largely consists in the restoration of nasal symmetry by methods which facilitate the excision of bone and cartilage, and the removal of intranasal redundancies. A variety of instruments are therefore required, their character being determined by the density and situation of the offending structures. My regular office operating-set consists of my wire-snare nasal écraseur, and transfixion-needles for removing soft redundancies; a fenestrated cartilage forceps, tubular-spring forceps, beaked scissors, and trimming scissors for excising cartilage; and my rongeur forceps for cutting through bone. Nearly all the operations indicated by these instruments are, through the benumbing influence of cocaine and rhigolene anæsthesia, rendered bloodless and painless. Most of you are acquainted with my methods of operating, and, inasmuch as more than a mere reference to them would exceed the limits and not accord with the purpose of this paper, I must refer those ignorant of these procedures to my earlier publications.

Appropriate treatment should also be instituted to heal and contract the raw surfaces, to remove and prevent the reformation of nasal crusts in the atrophic forms of the disease, and to check excessive discharges of nasal mucus. In other words, to borrow an expression from Niemeyer, "Where there is the slightest suspicion of a predisposition to consumption, every catarrh, no matter how slight, is to be treated with the utmost care, which is not to be relaxed until the catarrh is entirely well."

Conclusions.—Briefly reviewing the subject-matter I have just presented, you will observe that, in determining the relations of nasal catarrh to pulmonary phthisis, I have, in the order of its origin and sequence, commenced by observing and interpreting the catarrhal

manifestations as they occur in the nares, and have traced the gradual extension of the nasal disease to the larynx.

Within the larynx we discovered the catarrhal impress in the form of a chronic irritative hyperæmia of the larynx, brought about by the combined action of nasal discharges, habitual mouth-breathing, and inflammatory changes, chronic catarrhal hyperæmia of the larynx; to go a step further, ofttimes merges into an acute laryngitis, and this in turn may develop bronchitis. We recognize the deviated septum as a most common cause of nasal catarrh, producing this disease by pressure irritation, interference with nasal drainage, and unequal distribution of the nasal respiratory function. We have seen the importance of heredity as a factor responsible for the existence of certain forms of deviated septa, and noted the conditions indicating the hereditary character of these abnormalities.

Viewing the larynx as really the upper portion of the lung, although divorced from it on artificial anatomical grounds, we are often enabled to determine approximately, by the appearance of the laryngeal and tracheal mucous membrane, what conditions may exist beyond the line of laryngoscopic vision, and thus complete our pathological picture, beginning in the nares and ending in the lungs.

It is hardly necessary for me to insist upon the value of the lessons to be derived from the early recognition of the clinical facts I have just presented. They at least offer something tangible as regards prophylaxis against phthisis or tuberculosis, for their successful treatment falls in the positive domain of surgery. The results are for the most part favorable and speak for themselves, provided the methods which I have proposed and published for removing redundancies or the remedying of defects are not commenced too late.

It is hardly necessary for me to add that great care should be exercised to properly discriminate between cases in which pulmonary phthisis or tuberculosis precedes or exists with nasal catarrh, and are, therefore, not related to the last mentioned affection as cause and effect, and those developed by a catarrhal affection. Being mindful of this, I have felt the necessity of sometimes giving details which were indispensable but which may have been wearisome. It must also be borne in mind that errors are likely to creep in from difficulty or carelessness in differentiating distortions of the septum resulting from injury from those dependent upon heredity. My experience, however, encourages me to state that, different from what

you might probably imagine, in most instances, such a distinction, when properly made, constitutes a simple question of differential diagnosis. I have already referred to some of the rules which facilitate the recognition of the septum of heredity; and, were it advisable just here, I could mention other criteria of equal value. It is obvious that, in treating a subject of this kind, many questions present themselves, the proper interpretation of which must, for the present at least, baffle scientific investigation—such, for instance, as the proneness of some families with malformed septa to phthisis or tuberculosis, while others, on the contrary, are afflicted with annoying sthenic but, as far as the life of the individual is concerned, harmless pulmonary maladies. These, among similar speculations, though perhaps partly explainable by ingenious hypothetical methods, must, nevertheless, for want of sufficient demonstrative and experimental evidence, prove for the most part unintelligible. But even in the contemplation of such obscure problems the earnest investigator may derive encouragement from Prof. Huxley's remark, that "whatever may be men's speculative doctrines, it is quite certain that the order of nature is constant, and that the chain of natural causation is never broken."

First Day—Evening Session.

Paper.

PNEUMATIC DIFFERENTIATION.

By HERBERT F. WILLIAMS, M. D.

THE article which first drew the attention of the profession to this process appeared in the "Medical Record" of January 17th of the current year. It made no pretensions to completeness, and was written with the hope that extended observation by competent men in the profession would give to the subject treated its proper therapeutic position.

This process presents some facts so self-evident that their discussion is idle. To deny all therapeutic value to such an invocation of natural laws and forces would be absurdity itself. On the other hand, the claims in its behalf already made by overzeal are equally

unwarrantable. There is, therefore, a position in our therapeutics for pneumatic differentiation.

While it can not be said that experience hitherto gained has defined this position in all its relations, a few points already demonstrated will be presented, in the hope that their significance will provoke and encourage an inquiry that can not fail of wholesome results.

The five patients with phthisis reported as recovered in the original article remain in apparent health to-day, and, with the exception of two treatments given in Case No. 1 for acute bronchitis, there has been no necessity to resume. In Case No. 2 the patient has lost but one half-day from his employment as machinist since his discharge from treatment one year ago last March.

The subject of Case No. 5 has become a longshoreman, does the work of a man in his position, and commands a man's wages.

In Case No. 3 the patient remains at his employment in perfect health.

In Case No. 4 the patient is the same as reported. The slight drain from the fistulous opening in his side, however, prevents the rugged appearance of the other cases.*

On my first examination of this case, in which the principal lesion was in the left lung, I found what I regarded as primary changes taking place in the apex of the right. The present immunity from disease in the latter locality has suggested recent investigation of the other cases in which the phthisical process was confined to one lung.

I find that in no instance has the sound lung become diseased during the time of observation, and almost invariably I have been able to watch the patients until death or a subsidence of their symptoms. These observations, with their inevitable conclusions, furnish, to my mind, arguments in favor of a system of thorough antisepsis more suggestive and cogent than any hitherto offered.

The six patients with primary infiltration remain in perfect health with one exception. This patient, until two months ago, had exceeded the best weight of his life. In his occupation as solicitor he contracted a fresh cold, which ended, as before, in consolidation. Treatment was resumed, and Dr. De Watteville reports him rapidly improving.

In my investigations, formerly reported, I personally conducted the treatment. Since then the immediate administration has been

* These five patients continue in good health at the present time, September 25th.

in the hands of Dr. Fox in Brooklyn, and Dr. De Watteville and Dr. Tiegel in New York. Their clinical experience in more than seventy-five cases will doubtless be detailed by themselves.

They have, however, afforded me daily opportunity for consultation and continued access to their memoranda. Their courtesy enables me to make confident assurance that in their practice the relative results have been such as to confirm and emphasize the deductions originally published. Enough time has not elapsed to permit of extensive exploration in advance of the points then indicated.

I have deemed it profitable to collate many considerations which have been impressed upon me by the contemplation of this method and of the conditions in which it may be either appropriate, inadvisable, or doubtful. Many of the suggestions which I make in this connection have neither novelty nor significance except such as old and well-recognized material always assumes when brought into relation with original research in the same field.

It is suggestive of the value of the treatment that its development is in line with, and depends upon, physiological axioms. The continued use of this method will discover all degrees of adaptability and every shade of fortunate result.

If there is one thing known concerning pulmonary phthisis, it is that well-directed treatment must be early.

It is a safe, though not necessarily a correct, conclusion that, however careful may be the physical diagnosis, if we get evidence of lobular infiltration the probability is that more than one lobule is affected. If the ear detects a râle, there are several too distant for recognition.

I have long since come to base my prognosis upon an estimate of more trouble than I am able to detect. There is a great deal of truth in what I have recently seen written by an unprofessional pen: "Pure air is the life of the lung-tissue; irregularity in the supply is lung disease."

There may have been a time in our individual history when a catarrhal concretion, lodged in a remote bronchus, was the smoldering ember threatening a conflagration that would have consumed us had not one fortunate cough expelled the obstruction and removed the contingent congestion or infiltration. No one has a right to treat lightly the simplest cough when appealed to for relief or advice. Further back than this, if we, as physicians, are going to change the statistics in pulmonary consumption, we must inculcate the well-

known laws that are conducive to pulmonary health, and demand of the heads of our families a promise that they will compel their developing children to breathe properly.

We come, then, to the earliest opportunity when the benefits of this process may obtain. In childhood, when inflammatory action is so liable to be set up and where its consequences are so frequently overlooked on account of the elastic vitality of youth, we have a field for action in preventing the collapse of lobe and lobule and in removing all tendencies to the retardation of proper circulation, which not only produce immediate mischief, but may be, I believe, the cause of the easy development of the gravest symptoms in maturer life—as, for instance, the sudden hæmorrhage, without the appearance of a symptom that occasioned anxiety in the patient.

In the formative period of childhood and youth the proper expansion of the lungs will do much to prevent the pernicious consequences of improper frame development. The questions of treating actually instituted disease of the lung are too vast to comprehend in a single paper.

Thus far no patient able to apply for treatment has been refused, though in many instances the patients and friends have been told that temporary relief and improvement, if any, were all that could be expected. Indeed, I feel that in some cases of phthisis alleviation has been a greater achievement than recovery in others.

In any new form of treatment, and especially one as radical as this, the early applicants are those who spend most of their lives in seeking for that which they will never find, and would not appreciate if they did—viz., restoration to health. It has sometimes been difficult to exercise sound judgment and impart proper advice on account of their earnest solicitations. Such patients, if allowed, easily magnetize themselves at first, and will construe the feelings that are engendered by hope and novelty into actual improvement.

In all acute conditions such inspirations may be allowable, but the chronic cases demand the exercise of caution, though at the risk of reproach for coldness and apathy.

Through the careful labors of Dr. Austin Flint, we have been taught that there is a tendency to self-limitation in the phthisical progress.

I recognize in some cases a cessation of the severity of symptoms, and occasionally meet patients who profess to have outlived by many years the prognostication of the leaders in our profession.

So far as I know, no explanation has been offered for such conditions. I have questioned if further investigation in the life-history of the *Bacillus tuberculosis* may not bear a kindred relation to the germs of some of the eruptive fevers, where a thorough propagation renders the soil unfertile for subsequent thrift.

In a case under this treatment when, if I may so speak, the crisis has not been reached, every form of encouragement is permissible; but we meet some patients who have surprised everybody by recuperation, whose early gratitude has been succeeded, first, by two or three years of chronic process, then by growing unthankfulness, and finally by despair. They are quick to seek new devices, adopt strange methods, or grasp without discernment for anything or *everything* that promises well. When such a person applies to me he will have the benefit of my experience, which says that relief and improvement are all that can be expected.

To find a solution for this we have but to look at our post-mortem records, where fatty livers and hearts, or obliteration of the kidney cortex, with its frequent cysts and adherent capsule, plainly point to concurrent or dependent degenerative action. Where pyogenic cavities have guarded the system from frequent pyæmias, or where, from any cause, secondary assimilative or organic changes have not taken place, even though the patient may have suffered for years, I doubt not that permanent improvement or recovery may be expected.

It is to the treatment of these chronic cases that my remarks in the closing paragraphs of my first paper were mainly addressed. Good judgment suggests that rest and quiet are more applicable to some cases than ill-advised attempts at recovery, especially those that demand over-exertion in the patient. Still, such cases have been and must be met, and, with the nicety of graduation of pressure together with the influence of remedial or perhaps nutritive agents, and the certainty with which they can be introduced into the general circulation through the lungs, an improvement can be made upon what has thus far been accomplished by this process.

There is a great scope for discrimination not only in regard to the selection and administration of remedies in this manner, but also as to the force calculated to produce the best results. I have seen how unfortunate results may be ascribed to this process with which it may have nothing to do.

The irregularity of the symptoms that develop in the progress of phthisis is such that it is often difficult, if not impossible, to de-

termine whether untoward developments are a morbid incident or the result of therapeutic error.

The subject for earliest study was that which seems at first to trouble every investigator with whom I have conversed—viz.: The effect on the pulmonary circulation with reference to production or arrest of hæmorrhage.

All seem to have an exaggerated idea of the force best calculated to produce good, and, with a fear born only of unfamiliarity, shudder at the possibilities of calamity.

It is possible that the coincidence of instant death upon the first inspiration might arise; or, through carelessness or incapacity, too much power might be exerted, which would act as a direct cause. Human fallibility is such that it may be impossible to determine the existence of fatty-degenerated bronchial walls, attenuated alveolar septa, or unprotected or aneurysmal arteries or veins.

When the totality of the symptoms points to any or all of these conditions, it is incumbent on the operator to use every possible precaution. But, when such precaution is observed, I claim for the procedure the protection accorded any measure adopted for the administration of potent agents.

Exceptional disaster could not forbid intelligent use. It would be as just to return to primeval modes of travel through fear of railroad mismanagement. It is no argument against the therapeutic value of $\frac{1}{30}$-grain doses of arsenious acid that two or three grains may kill.

Originators in surgical procedure have outlived the obloquy of initial failure.

Chloroform is fatal as well as beneficent. But to those who are forward in their estimation of the dangers of this process I am indebted for valuable argument in its favor. It must be granted that the force is constant, for it is natural. An agent for harm may be made an agent for good when applied to suitable conditions, and its very malignity, when unrestrained, is an incentive to harness it for human welfare.

The healing art would be tame and loathsome if emasculated of every capacity for peril.

In the discussion following the very able paper read before the New York Academy of Medicine by Dr. E. D. Hudson, Jr., "On the Physical Examination of Weak Chests and Differential Diagnosis of the Several Forms of Early Phthisis," Dr. Loomis is reported as saying that "he had been able more than once to recognize the

presence of acute phthisis a number of weeks before the hæmorrhage occurred which ushered it in, and by means of the peculiar harsh quality of the respiratory sounds." My confidence in the preventive power of this process, together with the influence of an appropriate astringent, in this manner applied, is such that, should my lungs be judged by him to be in this condition, I should at once resort to this treatment to forestall such calamity.

In my first paper I spoke of the way in which the capillary circulation of the lungs was reduced by this means—namely, by decreasing the resistance of the blood in its passage through the lungs by the fuller inspiratory and expiratory effort. If it was my intention to obtain the direct hæmostatic effect, I should do what is always done when we can—in other conditions of hæmorrhage—apply pressure. The distribution of the circulating vessels of the air-cells and ultimate bronchi is such that, if a continued inflation can be maintained in them, exsanguination of their walls must take place. It is possible to accomplish this by a slow, full inspiratory act under any pressure thought desirable, maintaining this as long as can be with comfort. The expiration must not be made against the external air, but into the cabinet, and, as soon as possible, a full inspiration must again be made.

Such explanation might seem inadequate, but I think will be strengthened when I say that I have never seen hæmorrhage accompanying or immediately following treatment.

In each of six cases a single seizure has occurred at intervals of from twenty-four hours to several days after the last treatment. This did not interfere with the progress of treatment.

In another case, characterized for three or four years before treatment by at least annual hæmorrhages, the patient sustained with complete immunity thirty one treatments covering the month in which he had come to expect the recurrence of his trouble, had gained two pounds and a half, and was subjectively improved, when he was overtaken by a hæmorrhage which rendered further treatment inadvisable.

We need not speak in detail of the acute conditions in which theory and practice have demonstrated the great utility of this process. As clinical evidence is gained we can more accurately anticipate the probable result of treatment in given cases. The conditions under which remedial and, perhaps, nutritive agents can be administered are such that an improvement upon previous attempts at this method can be expected.

In the pre-tubercular stage, when imperfect nutrition and assimilation are the first indications of impending disease, much may be hoped for from this form of medication. From experiments recently made, I think it a close approximation to say that from ten to fifteen per cent. of the atomized solution can be condensed upon the respiratory area. In the treatment of emphysematous conditions great benefit has been produced in three cases. This is paradoxical, for at first sight it would seem that to expand residual air would of necessity stretch its enveloping membrane and, of course, aggravate the condition.

The forces that produce emphysema are largely expiratory. In my first paper it was shown to be impossible, by any judicious resort to the force at our command, to produce over-distension. The improvement that has followed the treatment of emphysematous conditions is undoubtedly due to the subsequent increased circulation of the blood in the diseased part, and the consequent improvement in the tonicity of the alveolar walls due to improved nutrition. It may be also due to the removal of excess of catarrhal secretions in the ultimate bronchi or any anterior point. Mr. Ketchum has completed a device by which alternate rarefaction and compression of air can be made synchronously with the respiratory act, or by which either compression or rarefaction can be maintained at the will of the operator. This will enable us to obtain all the results of the compressed air-bath with which we are familiar, and to which our attention has recently been called by the lectures of Dr. C. Theodore Williams, of England, and by the methods well known throughout the Continent.

I am indebted to Dr. Teigel and Dr. De Watteville for the following report of cases occurring in their practice:

W. P. M.; occupation, barber; presented himself for examination April 18, 1885; age, twenty-seven years; colored. Best weight, 132; present weight, 120. Temperature, 101–102°. Expansion, two inches.

Condition.—Married; no children.

Family History.—On father's side, mulattoes; on mother's side, octoroons. Family history, negative.

Personal History.—A little over eighteen months ago he caught cold and could not get rid of it. He got weaker and weaker. Consulted Dr. Speir in Brooklyn; was told that his lungs were very weak, and was sent to the country. There he received great benefit, and returned, he thought, a well man. He soon fell back, however, and got very much worse. Heavy cough day and night. Complete loss of appetite; never had any pain, however. Last December coughed up quan-

tities of heavy fœtid yellow matter. He does not expectorate much, but has a dry cough, which gives him no rest. He is losing flesh, has fever every night up to 102°, and is extremely short of breath.

Inspection.—A poorly developed thorax with insufficient expansion. Body emaciated. On both sides the thorax is flattened below the clavicles, amounting on the right side to a positive excavation.

Palpation.—Thorax resists pressure and is not normally elastic, especially on upper half. Vocal fremitus much increased, especially on right side.

Percussion.—Dullness and high-pitched note on right side in clavicular and supra-mammary region. Less marked on left. On right side the sound is tympanitic, and changes character and pitch when mouth is opened or shut. With open mouth it gives a typical cracked-pot sound. This tympanitic percussion note is limited to a space the size of a hen's egg. Percussion sound improves as we approach the middle third. On left side it is better than on right.

Auscultation.—On right side, in clavicular region, cavernous breathing, but not accompanied by gurgling. Vocal resonance much increased in upper third. Breathing tubular. Expiration saccadent and prolonged. Râles of every description—loud, sonorous, and sibilant—are heard in very low breathing; fine crepitant râles are observed. They diminish as we descend the thorax, and are infrequent on lower half. On left side very much the same condition exists, though not in the same degree. Dry râles are heard in front and back, but diminish gradually till they nearly cease at the base.

Course of Treatment.—Three times weekly. Began on April 18th. Commenced with $\frac{3}{10}$ inch and a spray of a solution of 1 per cent. ammon. chlorid., 5 per cent. glycerin.

April 25th.—Increased to $\frac{6}{10}$ inch. He breathes nicely, but his respirations are limited. He reports that he sleeps well at night, and that his appetite improves. He has expectorated a great deal.

May 1st.—Respiratory sounds are stronger, but râles still present in great number. The objective signs are very little changed. Subjectively, patient is in high spirits. He eats voraciously, has a normal temperature even at night, coughs during day, and expectorates heavily. He feels "splendid."

6th.—Changed to red-bark decoction (made by Mr. Beudiner, Tenth Street and Third Avenue).

12th.—Caught cold during damp days, and developed catarrh on left side. Coughs much, and does not look so well.

27th.—Marked progress. Patient has gained strength, so that he was able to assist and officiate himself in house-moving, going up and down stairs frequently. Feels none the worse for it. The left lung has recovered. On right side the râles have much diminished. On left side the improvement is marked, with exception of the region of the clavicle; the râles have nearly disappeared; here and there fine crepitant râles

are heard still. The expansion is limited still, but has increased about half an inch.

The breathing in clavicular region has changed in character, the note being higher and the character more tubular than cavernous. Percussion, however, still shows the former symptoms, although the space where the cracked-pot sound is heard seems to be more limited. Subjectively, the patient's account of himself leaves nothing to desire. He coughs still, but only when he gets rid of mucus. Sleep is good, appetite good. Temperature normal. Strength improved, but by no means great. Talks of returning to work soon. He takes treatment with great regularity three times weekly, and intends continuing for some time.

M. O., aged thirty-six years, married; one child, which died of hydrocephalus and spina bifida. Patient presented himself for examination on March 28, 1885.

Family History.—On paternal side, negative; on maternal side, frequent throat troubles. One brother died four months ago of tubercular laryngitis and pulmonary phthisis.

Personal History.—Patient has for many years suffered from catarrhs, cough, and light attacks of pleuritic pains. Since New Year's the cough has much increased, often producing broken sleep, loss of appetite, and a general tired feeling; short breath on the least exertion. A dull soreness, accompanied sometimes with sharp, stitchy pains on left side, on the back, under the lower half of scapula; also on right side in the mammary region, between the fourth and sixth ribs, accompanied by wheezing at intervals. He feels feverish at night, and has to take quinine frequently. His occupation (broker) exposes him to draughts and constant changes of temperature. He is losing flesh.

Inspection.—A tall man, not very well nourished, with an extremely long and narrow thorax. Complexion pasty and pale; lower eyelids baggy; voice slightly hoarse. Hands long, clammy, and finger-nails thin, round, and bent forward extremely. Respiration jerky and quick, especially on least exertion. Respiratory movements extremely limited and chiefly abdominal. Full expansion at mammary line not quite two inches.

Palpation.—Respiratory fremitus exaggerated on right side in front, also on left side under scapula. Apex-beat of heart normal.

Percussion.—Dullness and high-pitched note, but not extreme, on the upper two thirds of right lung in front. Left side, normal resonance, except in the scapular region.

Auscultation.—Right side front, saccadent breathing and prolonged expiration; character vesicular. Fine crepitant râles are heard as far as the sixth rib, and very slightly in the clavicular region. In the region of nipple, fine sibilant râles at end of inspiration and during expiration. Respiratory sounds, on the whole, are feeble. *On left side front* the sounds are more normal. Behind, under scapula, loud sonorous and sibilant râles; also fine crepitant râles, especially during expiration.

Course of Treatment.—March 28th, three times weekly, $HgCl_2$ $\frac{1}{2000}$ to $\frac{1}{1000}$, with $\frac{3}{10}$ inch. Breathes with difficulty, and very jerky.

April 3d.—Complains of more pain under scapula.

8th.—Increased to $\frac{6}{10}$ inch.

11th.—Varied with inhalation of iodine.

20th.—Increased treatment to six times weekly. Tried decoction of red bark containing four and a half per cent. cinchona red (tannin).

30th.—Patient is much improved; breathes easily and fully against $\frac{8}{10}$ inch; râles nearly gone; pains gone.

May 3d.—Got his stomach out of order and got cold (neglected precautions). Sibilant râles appearing again, but with considerable expectoration.

6th.—Râles entirely gone. Pain has completely left.

10th.—Reduced to three times weekly; continue steadily with red-bark decoction.

27th.—Patient has not turned up for treatment for over a week. On last examination the objective signs were gone, as far as auscultation showed it. He is looking much better; sleeps well at night; his appetite good, at least fair; coughs a little in the morning, but not during the day. He is still a little short-breathed, but nothing like before. He should have continued for a few weeks longer, but his business, he said, called him away.

Discussion.

The President had seen the patient to whom the author referred as having had a hæmorrhage within twenty-four hours after a treatment. The patient had had thirty-one treatments, and the hæmorrhage occurred after the thirty-first. He had been under Dr. Loomis's care for four years, had, he believed spent one year in the Adirondacks, and had supposed that he had entirely recovered. At any rate, he went back to his work as a lawyer, promising to spend four months in the Adirondacks every year. It was not necessary to mention all the physical signs which had been present; there had been well-advanced phthisis on the left side near the apex. He did not go to the Adirondacks, but to the Berkshire Hills, last summer. Dr. Loomis had not heard of him for more than a year and a half, when he was called to visit him two or three months ago while having a very profuse hæmorrhage, which had gone on for a number of days. He said that he had had the treatment according to Dr. Williams's method a great many times, but that the last time he thought there was a little carelessness in the manipulation. At least he attributed the hæmorrhage which occurred to that. The patient did not think the treatment was dangerous if it was properly administered. The hæmorrhage continued for three or four weeks. That was the only case Dr. Loomis knew of in which hæmorrhage had occurred in connection with this treatment.

Dr. Williams had one or two other patients who were doing well.

One, a lady, had done very well under this special treatment. She had a cavity in the lung, and had been the world over for her health. She had remained at home the past winter, and was much better than in the autumn.

Dr. Armor, of Brooklyn, had been interested in the treatment and views of Dr. Williams, and had kept under observation some patients so treated. He thought the matter could be stated in a few propositions, some of which might have to be considered hereafter: First, the benefit of the expansion of the lungs by the apparatus without reference to the local medication. Second, the question as to whether antiseptics and other agents could be introduced more deeply into the lung substance by this means than by any other device which had been proposed. Third, the practical result, which was to be tested by clinical observation. He was aware that an instrument of this kind should be in the hands of careful observers, who were capable of diagnosticating their cases and of appreciating the results. It might be a dangerous instrument in the hands of others. He thought it should be most carefully guarded by most careful men. One case had recently come under his observation in which he had been very much interested. He carefully examined the young man before he was submitted to treatment. When he came to Dr. Williams's office he was so weak and emaciated that he had to ride in a carriage. It looked to him like a very unpromising case. He had a few weeks before an attack of pneumonia, probably on the right side. Dr. Armor found the patient, as stated, very much emaciated, feeble, rapid pulse, feeble expansion of the lung on the right side; below the scapula were marked dullness, entire absence of respiratory murmur, and above râles. It looked like a case of unresolved pneumonia. On submitting the patient to a treatment, the lips looked redder and a good deal of expansion of the lungs took place. He did not see the young man again for about a month. Dr. Williams told him that after a few days' treatment there began to be moist râles in the lower portion of the right lung and quite free expectoration. Dr. Armor found at his last examination still slight dullness below the scapula over the region referred to, but much less than formerly; there was respiratory murmur all over that portion of the lung, but a little feebler than on the other side; there were no moist râles. The symptoms had entirely abated; there was absence of fever, the general appearance was good, the appetite good; he had gained about a pound a week, and had walked a distance of two miles to his office. There was certainly a very remarkable improvement in the condition of the lung, whether it was due to constitutional treatment or to the instrument. He had had thirty-one treatments. In a letter to him, Dr. Bowditch, of Boston, had said it was his impression that this treatment would mark a new era in management of the pulmonary affections.

Paper.

THE HOME TREATMENT OF PHTHISIS.

By F. C. SHATTUCK, M. D.

ABOUT ten years ago, when making a visit in a French hospital, I heard the epigrammatic professor say to those who accompanied him: "For phthisis, gentlemen, there are but two remedies, opium and lies." Of course he did not mean his statement to be taken in absolute literalness, but the remark affords a good illustration of the view which has been held in the past by the profession and the laity alike, but which is undergoing, and will undergo, further modification. Let me quote what another French professor, M. Jaccoud, says in his work, the English translation of which has just appeared: "To sum up what has been stated, pulmonary phthisis is curable in all its stages. This is the prolific notion which presides over the whole history of the disease, and which should unceasingly inspire and direct all medical action." *

There is very little disagreement among doctors as to the fact that the chances of recovery are much better for patients so situated that they can have a suitable change of climate, or, at all events, move from the city to the country; but is removal indispensable to cure? The experience of nearly every physician in active practice answers this question more or less conclusively. Dr. Flint has shown that a certain proportion of the phthisical recover not only without climatic, but practically without any treatment; that in some cases phthisis ends by self-limitation. But allow me to dwell for a moment on the vital statistics of my own State. In 1857, 39·50 deaths from consumption occurred in Massachusetts for each ten thousand of the population; in 1883, 29·90, the diminution being gradually progressive during this period, as is seen in the accompanying table which I take from the registration reports. These figures show a still larger decrease in the mortality from consumption among the native population, for the decrease has taken place in spite of the constant influx of foreigners, and notably of the Irish, who are proved, by the studies of the late Dr. T. B. Curtis and others, to be especially prone to this disease.†

* "Curability and Treatment of Pulmonary Phthisis," translated by Lubbock pp. 27 and 28.

† For full details on this latter point, which it is impossible for me here to further develop, I must refer to the very able "Report on the Sanitary Condition

Death-rate from Consumption in Massachusetts per Ten Thousand.

1857	39·50	1871	33·93
1858	38·42	1872	36·26
1859	38·85	1873	35·36
1860	37·02	1874	32·80
1861	36·77	1875	34·73
1862	34·28	1876	32·35
1863	37·26	1877	32·93
1864	37·89	1878	32·00
1865	36·79	1879	30·42
1866	35·33	1880	30·81
1867	32·55	1881	31·50
1868	32·20	1882	30·10
1869	32·88	1883	29·90
1870	34·33		

This decrease is altogether too large to credit to greater accuracy in diagnosis and to the transference of consumptives to other States, but is mainly attributable to the prevention of phthisis by improved hygiene, especially among the native-born. Still it seems to me fair to carry some of the improvement to the account of the arrest and cure of actually developed disease through early diagnosis and more rational home treatment, hygienic as well as medicinal.

There are two classes of consumptives for whom the home treatment is the only treatment—those whose means do not allow a change of climate, whatever the condition or stage of their disease, and those whose condition is such that, whatever their means, they had better stay at home and die among their friends, surrounded by the comforts which are to be found in the homes of the well-to-do, but which can so rarely be secured, especially in this country, in hotels or boarding-houses. It is true that some of the latter class, buoyed up by the hopefulness so often characteristic of this disease, will not be said nay, and succeed in finding a physician who counsels a change or else take the matter into their own hands; these do not, however, immediately concern us. Nor does it come within the scope of my paper to discuss the questions as to the rules which are to guide us in selecting cases for which a change of climate is desirable, or in selecting a climate for any particular case. The fact remains that the vast majority of consumptives must, perforce, re-

of Boston," written by Dr. Curtis in behalf of a medical commission appointed by the city. The report was published by the city in 1875.

main at home. How can we best aid the recovery, prolong the life, and alleviate the sufferings of these patients?

I have no novel or startling views to lay before you, and shall probably not be able to tell you anything which you do not know already. In the discussion which follows the paper, if not in the paper itself, there will be valuable suggestion. What I have to say is, of course, without special reference to the particular climate which may belong to the home of the can't-get-away consumptive.

The consideration of the treatment of phthisis falls naturally into two great divisions, the hygienic and the medicinal; let us take up the more important first, including under hygiene food, morals, fresh air, rest and exercise, dress, and bathing.

Phthisis (or the tubercular bacillus, if you will) resembles one of those weeds which grow only on poor or neglected soil, but it also exhausts completely what measure of virtue the soil may have; hence, by every means at our disposal, we should seek to improve the general health of our patients, that we may aid nature in choking out the disease. The key to the position in the present state of our knowledge is in attention to digestion. A patient of mine, a brilliant example of complete recovery, said to me: "As long as my stomach held out I was not very anxious." Every consumptive should eat the maximum amount of nourishing food which he can digest—which he can digest, let me repeat—for, as Lauder Brunton pithily says, we should always remember that food within the gastro-intestinal tract is still practically outside of the body. There are general laws of dietetics, and we know how long it took the stomach of St. Martin to deal with many different articles of food. Certain materials and certain methods of preparation agree better than others with the majority of mankind; but in dealing with patients we give our advice to individuals, not to men or classes of men collectively. In dietetics, as in a Western mining camp, every man is in large measure a law unto himself. I am often reminded of a wretched child suffering from congenital syphilis and rickets, among other things; the bowels were loose, did not improve readily under treatment which I considered to be suitable, and the weather was characteristic of the season—summer; so I sent the child and its mother to a healthy place in the country, with careful directions as to diet and drugs. After some weeks the mother returned with more of a child than she took away, and, on questioning her, I learned that for a time she conscientiously followed my directions, but was not rewarded by seeing any improvement; blueberries were plenty in

that part of the country, the child craved them, the mother with misgivings gave them, and the diarrhœa promptly ceased. Our distinguished member, Prof. Flint, says, in writing of dyspepsia, that sufferers "must follow the dictates of instinct rather than any precise rules." I was delighted to find this warrant for the assent which my far more limited experience has led me often to accord to the request of patients, and particularly consumptives, for special articles of food, however bad the reputation of such articles as regards digestibility might be; never in the case of a consumptive have I had reason to regret the indulgence. I think we are perhaps oftener called upon to give minute directions as to the frequency with which food is to be taken than as to the form which it is to assume. Much more work can often be got out of the stomach without remonstrance by five, six, or seven light meals a day than by three heavier ones. A glass of milk or the like, with or without a raw egg, and a little alcoholic stimulant, midway between meals and at bedtime, may be of more service than anything contained in the drug-shops; and a cup of hot bouillon, as soon as possible after waking, will carry a patient over his morning cough, bath, and toilet, with a good appetite for breakfast. I have repeatedly seen this simple expedient make a great difference in the comfort of the whole day.

Alcohol, in such form and quantity as careful observation of the individual patient shows is best tolerated, is indicated in most, though not in all, cases. Any toxic effect is to be avoided, and the influence on the appetite and digestion is to be watched; there is room for the exercise of much judgment in the use of this form of food, and that a certain amount of alcohol is, under certain conditions, a food, I have myself no question.

With forced feeding after the manner of Debove I have no personal experience, and dismiss the subject of diet with the repetition of the axiom that in phthisis the physician should see to it that his patient takes all the nourishment he can digest.

The moral management of the case requires a few words. Here there is scope for the most delicate tact and the most intimate knowledge of human nature. Some patients need to be frightened, some to have their fears allayed. Let science clarify and sharpen our vision; let it not render us so hypermetropic that we do not see distinctly the individual in the patient before us. I think we are sometimes inclined to forget what a powerful therapeutic agent prognosis may be. Let us give the patient the benefit of every doubt

remembering that the prognosis represents our opinion, not inevitably the truth. An unfavorable opinion should often be reserved for a near and judicious friend, if the patient be so fortunate as to have one. All patients are not so tenderly considerate of their physician's mistakes as was the young lady who recovered after she was given up by her doctor, and ever thereafter, when she met him, blushed for shame. Occupation is another branch of moral treatment which must not be lost sight of.

Dress need not detain us long. Consumptives are apt to err on the side of too many and too heavy clothes, keeping the skin in perpetual action and wearying the body by mere weight. The ordinary house-dress of the average man in our climate in the winter season weighs eight to ten pounds. Let the consumptive wear wool or silk next the skin from the neck to the toes, and let him change them frequently; a change of stockings several times in the day will often obviate the discomfort of cold feet. It is important, especially with the poorer class of patients, to insist on wool, and warn them not to allow the shopkeeper to pass off a cotton for a woolen garment.

Too much stress can scarcely be laid on the importance of fresh, pure air. Carbonic acid and carbonic oxide are poisonous enough to well people, but how vastly more deleterious to those suffering from a constitutional disease manifesting itself in the lungs! Fortunately, sounder ideas prevail on this point than was formerly the case, but there is still room for improvement. The apartments occupied by the patient should face the south if possible; it seems to be thought by some that the exposure of a bedroom is of no consequence, as if a third of the life of a healthy person were not passed there. An open fire of wood or soft coal should be kept up in the living-room if possible, and ventilation should be carefully provided for. In severe or windy weather a simple frame fitted to the window and covered with flannel can be put in at the top, a weatherstrip on the lower edge of the upper sash preventing the rush of cold air which would otherwise occur between the sashes. Fresh air can thus be constantly introduced without causing any appreciable draught. Equal solicitude should be given to the ventilation of the sleeping-room. I am often struck by the appearance of the houses in our most fashionable streets. In streets running east and west land is apt to be higher in price on the north side, which, of course, alone gets any sun during more than six months of the year. Of shades and curtains there are often half a dozen series,

and during the forenoon the shades are pulled down and fastened at the bottom that the precious furniture and carpets, more highly valued by the owner than health, may not be faded; the sun is paid for and then excluded for the sake of the furniture. Those who can not afford delicate fabrics are better off.

So much for fresh air and sunshine in the house. Fresh air without the house is naturally considered in connection with exercise. We should insist on out-door exercise in such degree and form as the strength of the patient, the length of his purse, and the season will allow. Driving should, if possible, be in an open vehicle, which for a weak person should have a high back, and in windy weather a veil or a respirator should be worn by the occupant. People are finding out that sleighs are not the only open conveyances which can be used in winter. I believe that with proper precautions there is, as a rule, more risk of catching cold in a close than in an open carriage. Exercise in the saddle, if desirable or practicable, has the great advantage over walking that it distracts the mind as well as uses all the muscles.

We find that a certain number of those who consult us have been doing too much. I have repeatedly seen fever greatly diminish or cease entirely after putting the patient to bed, with abundance of fresh air, for a few days. It is not enough to tell patients to avoid over-fatigue; very few know what this means. I often try to explain somewhat as follows: "A fatigue which passes away after resting an hour or so on the completion of your exercise is natural and healthy, and therefore does you good rather than harm; but if you find that, in spite of a reasonable rest, you are still tired, you have done too much." Such a rule I believe to be safe.

There is a popular idea that there is something about the night air which is particularly dangerous to consumptives—an idea which, like many of those bearing on medicine and current with the laity, probably came originally from the profession, which advances in knowledge faster than the public. The night air is all the air there is at night, and in non-malarious regions the danger of going out in the evening does not lie in the quality of the air, but in the fact that persons are at that time often tired and, consequently, more sensitive to alterations of temperature, or any other demand upon the vital forces; the bearing of this observation is sufficiently patent.

The character of the employment of the consumptive is also to be borne in mind, and an out-of-door occupation, involving no severer toil than the patient can stand, should be followed if possible. Too

often this is impossible; but we must do the best we can under the circumstances.

Patients who are too weak to take any active exercise often derive great benefit from a sun- and fresh-air bath. In the country a little shed can be built, open toward the south and sufficiently deep to keep off the wind from the patient sitting in a chair or lying on a mattress. In the city an easy-chair can be placed near a widely opened southerly window. The invalid should have as many blankets or robes as he wishes. No matter how low the thermometer, if the sun shines brightly there is rarely any difficulty in keeping warm, and a small sun-shade or similar contrivance is often needed to protect the head. No artificial heat has the penetrative power of the sun, and I have repeatedly found patients, who were horrified at the idea when first presented to them, enthusiastic in their expressions of satisfaction at its practical working. In city streets people often object to this measure from a fear of appearing peculiar to their opposite neighbors or passers-by. I have found it a most valuable means of treatment for those who are debilitated from any cause.

Gymnastics, with the view of expanding the chest and promoting the absorption of diseased products in the lungs through the improved circulation thereby brought about, have perhaps not received so much attention from the regular profession as they deserve. Of course, exercise of any kind quickens the circulation; but this is not clearly understood by the laity, and the imagination is more excited by means which are manifestly directed immediately to the seat of the disease. Respiratory gymnastics have thus a double value, and precise directions are more likely to be followed than those which are purely general. I know of a "doctor" who has apparently found it very profitable to teach people how to breathe, and I do not doubt that some of his patients have found it profitable to learn; he thus prevents and cures consumption, reduces the weight of those who are too fat, and augments that of those who are too lean. A grain of truth is none the less precious because it is covered with an investment of quackery.

Another and the last branch of hygiene on which I shall touch is bathing. Cleanliness is desirable in itself, and it is quite as important for the phthisical as for the healthy to maintain a proper action of the skin. After a warm bath, unless it is followed by a cold douche, exposure to cold is to be carefully guarded against. A cold bath is a powerful tonic; but how are we to determine in a

special case the proper temperature? Of course, in many cases cold baths are out of the question, but probably not in as many as is generally supposed. It is the reactive power of the patient rather than the thermometer which should decide the temperature of the cold bath; the colder the better, provided that thorough, prompt, and persistent reaction follows, promoted by a brisk rubbing with a coarse towel or a flesh-brush. The use of a cup of hot bouillon before the bath has already been alluded to, and reaction may often be further aided by the addition of rock salt or some other cutaneous stimulant to the water. That the systematic study of hydro-therapeutics as one of our weapons against debility will receive more attention in the future than it has in the past, I have no question.

The medicinal treatment may be divided into the general or curative, and the symptomatic or palliative, the object of the former being to stimulate and improve the general nutrition, that of the latter to check as they arise such symptoms as militate against the recovery or the comfort of the patient. Such a division may be artificial, but, for our present purposes, is convenient.

If we always bear clearly in mind the fact that our aim in giving general medicinal or tonic remedies is simply to promote assimilation, and thus put our patients into a condition more favorable to recovery or less favorable to the rapid advance of their disease, among other advantages we are apt to choose more judiciously the special form of tonic which is most likely to be of service. Cod-liver oil, either pure or in one of the numberless disguises which it is made to assume, and some of which certainly have their places, needs no commendation from me. It is, perhaps, a food rather than a drug; but a food which demands a certain amount of digestive power, and we all see it prescribed when it does more harm than good, for the very simple reason that digestion is not equal to it. With many physicians the diagnosis phthisis is followed by the prescription oleum morrhuæ as the thunder follows the lightning. "The doctor told me to take cod-liver oil, but I can't keep it on my stomach," said a feverish young girl without appetite who consulted me only yesterday. In my experience this remedy is generally to be avoided if the tongue be coated and the appetite poor; if, in addition, there be fever, the case is still clearer. The fever requires always fresh air, often rest, with quinine or another antipyretic, and the stomach a bitter tonic, as a rule, combined or not with a laxative, according to circumstances. After a week or two of such treatment

the appetite and digestion are often so much improved that cod-liver oil is borne. If there is any doubt as to its toleration, it is better to begin with teaspoonful doses and gradually increase to the full dose as warrant is found for doing so, the full dose being much larger than most of us have been in the habit of using, if the views of Jaccoud are correct. If the pure oil is well borne, I believe it to be better than the more palatable though weaker preparations, and the remedy is not to be thrown aside without a fair trial, inasmuch as a stomach which is rebellious at first sometimes accepts the situation with apparent cheerfulness after a few days' cautious persuasion. It is not needful that I should enumerate or dwell upon the various emulsions, etc.; the advertising pages of our journals, circulars, and the periodical visits of the affable gentlemen with hand-bags, remind us of them sometimes in moments when we would fain forget them. The fact remains that cod-liver oil pure, or never so skillfully emulsified, is worse than useless unless it can be digested; if it can be digested, it is a most valuable form for the administration of fat, a material which long and wide experience has shown to be especially indicated in consumption.

Jaccoud recommends highly glycerin, ℥ jss.–ij daily, as a substitute for cod-liver oil when there is fever.

Ferruginous tonics are sometimes of use for short periods if there is notable anæmia, but are contra-indicated by a coated tongue and sluggish bowels. Arsenic, on the other hand, either in solution or pill, has a much wider application than iron in phthisis, and should often be continued for long periods. The dose should be as large as is perfectly well borne, and it is sometimes well to omit it for a week and then resume. It interferes in no way with the administration of cod-liver oil or glycerin. The diastatic tonics and the hypophosphites also have their place, and often seem distinctly to aid a feeble digestion, thus contributing toward a gain in flesh and strength.

The leading symptoms which call for interference, and to which I shall briefly call your attention, are cough, pain, night-sweats, diarrhœa, and hectic with its attendant nervousness.

Patients often say to us, "Doctor, I have taken your medicine, but my cough is no better," the cough representing to them the disease. In a semeiological sense they are largely right, but in a therapeutic sense very far wrong. When the cough ceases entirely the patient is at the door either of recovery or death; but we know, even if our patients do not, that, as long as there is mischief in the

lung, cough must persist. How often do we see consumptives who, generally on their own notion or acting on the suggestion of friends, but, unfortunately, sometimes in accordance with medical advice, are taking cough mixtures to their detriment! In advanced cases, which must sooner or later prove fatal, such an error is of less consequence; but in early cases the effect on the appetite and digestion is often disastrous. Coughing may be very hard work, but before we interfere with it there is one main question we should ask ourselves: Is the cough in the case before us useful or needless? I speak of cases relatively, not absolutely. A cough which is followed by expectoration is not entirely in vain, while that which is simply irritative wears out the patient. The former is not to be checked by any means which involves the risk of impairing the digestive power unless it provokes vomiting or breaks up the night's rest, which is of such vital importance that we are justified in seizing the two-edged-sword opium to obtain it if milder means fail. The surest way to diminish excessive expectoration is to pay close attention to hygiene and diet, though suitable inhalations will sometimes help. The type of the useful cough is that which occurs on waking in the morning, and which clears out the secretions that have accumulated during the superficial respiration of sleep. The value of a hot drink, which with a spirit-lamp at the bedside and five minutes' time is ready, as an expectorant at this time has been already spoken of. If this is not sufficient, a little alcohol or a stimulating expectorant, like carbonate of ammonia, can be given in addition.

The teasing and irritative cough, on the other hand, it is our duty to check if we can, but by the mildest means at our disposal which will accomplish our object. Oftentimes I have found chloroform-water stand me in good stead; but there are cases in which the narcotics, and especially morphia, must be used; the great danger of morphia is that it is so efficient in relieving cough that we are tempted to use it indiscriminately, thus doing great harm. One of the most distressing forms of cough met with in the phthisical is that hard variety which leads to vomiting, consuming the patient like a candle lighted at both ends; this generally calls for opium in some form, though it is well to try the effect of an alcoholic stimulant first. Especially in those cases with sharply localized pulmonary lesions, counter-irritation over the seat of the disease will often economize drugs and the stomach alike. The ammonia blister is a favorite form with me.

For the thoracic pain which is apt to be more or less pronounced

at times in nearly all advanced and some early cases, and which is sometimes rheumatic or neuralgic, sometimes pleuritic, we are called upon to prescribe. Counter-irritation with mustard, chloroform, a liniment, croton-oil, and the like, generally proves sufficient, though here again we are sometimes forced to use opium. When the pain is fairly localized I find that the application of a dry cup or two, a simple remedy which has gone too much out of fashion and of which any untrained attendant can readily be taught the use, is often followed by marked relief.

Another symptom which demands interference is night-sweat, sapping the strength of the patient and marring his sleep. Sometimes it is a very easy matter to control this overaction of the skin, sometimes it is very difficult. Hence it is well to have many strings to our bow; we are not infrequently compelled to try successively aromatic sulphuric acid, oxide of zinc, ergot, atropia, quinine, or Dover's powder internally, or dusting powders, sponging with acids, alkalies, alcohol, or tincture of belladonna externally, before we meet with success. If the patient can bear it, active friction or shampooing of the skin is often desirable. I have given a good deal the pill used in the Victoria Park Hospital containing morphia and atropia, combined with a little capsicum and a laxative if required; night-sweats and cough are both controlled by it, but my objection to atropia lies in the difficulty of so adjusting the dose that the desired effect on the skin is obtained without producing an undesirable degree of dryness of the throat. In two cases I have succeeded with picrotoxin after having tried in vain every other remedy of which I could think.

There can be no more question as to the propriety of trying to relieve diarrhœa than there is with regard to pain and night-sweats. When the loose discharges depend on ulceration, and still more when they depend on amyloid disease of the intestine, they are apt to be difficult to restrain; and yet in some cases of tubercular, as of typhoid ulceration, so far from diarrhœa being present, there is constipation. It is needless to say more than that the treatment is by astringents and opium, the particular remedy in any given case depending on the urgency of the symptom, trial, and any known peculiarity of the patient. In cases where there is any hope of recovery, if we give opium we should strive, while we give enough to attain our end, to give no more than is necessary.

For nervous irritability, whether manifested by a worried but

healthy adult, a teething child, or a phthisical person, a plentiful supply of cool, fresh air is the first indication.

Against the fever of phthisis antipyretics have, as far as I know, been but little employed in this country. I certainly have made no systematic use of them myself. The fever is not the disease, and the cases must be very rare in which a diminution of the pyrexia for a few days may make all the difference between recovery and death, as is sometimes true of the more acute infectious diseases. At the same time fever works to the detriment of the patient in two ways—diminishing his income and also squandering his capital. Therefore, if we can combat it without destroying what little digestive power it is apt to leave, clearly our duty is to do so, and I propose to give the method which Jaccoud thinks has yielded him admirable results a thorough trial. It is perhaps scarcely fair, either to him or to you, to try to describe in a few words what his method is; but the gist of it is the administration of large doses of quinine for inflammatory fever by the mouth or under the skin, the hydrobromate being always chosen for the latter avenue of introduction into the system, while for the fever of absorption large doses of salicylic acid by the mouth or salicylate of soda hypodermically, if the stomach is irritable, are chosen. Whether we shall all find it as easy to differentiate the forms of fever in phthisis as does Jaccoud I do not know, but the subject of fever is far too large for our present opportunity.

My slight sketch of the home treatment of consumption is now finished. The different aspects of the question afford material for a dozen detailed pictures, and there are two important lines of treatment of which I have purposely omitted all mention—inhalation, notably by antiseptics and oxygen, and the use of artificially compressed and rarefied air. Perhaps I am wrong, but the published reports of the experience of Pepper, Beverley Robinson, and others, has not encouraged me to try antiseptic injections into the lungs; nor have I ever practiced the free incision and drainage of pulmonary cavities.

Discussion.

Dr. P. Kretzschmar indorsed the remarks of Dr. Shattuck. There were some points which perhaps deserved further consideration. One related to the sleeping-room. As we all knew, one third of the time of every human being was spent in the sleeping-room, and he therefore thought that more attention should be given to this matter in the hygienic treatment. He had in mind particularly the question of the size

of the sleeping-room, the question of the consumptive sleeping with other persons, and the question of leaving the windows open at night. The home treatment of consumptives related especially to the poor, and here we were apt to find five or six persons sleeping in a small room badly ventilated. He thought more could be done by the administration of pure air if attention were given to the ventilation and size of the sleeping-room, where the patient spent a third of his life, than by other means. He, of course, approved of the author's remarks concerning the ventilation of the sleeping-room during the day. The second point was, Should we not advise our patients, especially those inclined to phthisis, against sleeping with others? A third point was, we did not usually pay sufficient attention to the frequent and thorough removal of the sputa from the sleeping-rooms. In addition to the remedies mentioned, he recommended cold sage-tea before going to bed.

Dr. Robinson said he did not wish in any wise to criticise the paper as far as it went, for he agreed with Dr. Armour, who considered the paper an admirable presentation of the subject, but he regretted that the author had not mentioned three modes of treatment which he believed physicians might find of advantage in the treatment of phthisical patients at their homes after other methods had failed. The first was forced feeding, giving patients more food than they craved, and even more than the stomach could digest if the food was swallowed. The second method related to intra-pulmonary injections; the third to antiseptic inhalations, with regard to which he had presented his views in a paper to-day. These methods had been tried in St. Luke's Hospital during the past winter. A young man came into the service of Dr. Ball six or eight months ago, afterward into Dr. Kinnicutt's service, and finally into his (Dr. Robinson's). On admission, there was evident pulmonary infiltration at the apices, and the stomach was absolutely intolerant of the smallest quantities of food. Nearly everything was vomited. By washing out the stomach and pouring food into it through a soft tube they were enabled to give the patient nutriment, and increased his weight at least six or seven pounds. Beyond this increase in weight, the patient's phthisical condition was in no sense ameliorated. We had to take such a case for what it was worth. We certainly could not take it as showing that phthisis was made better even by improved nutrition; but it showed that we could increase the patient's weight and thus better his condition.

With regard to injection of infiltrated lung areas, he could only repeat what he had before endeavored to emphasize, namely, that there were certain cases in which we were unable to arrest cough by other means, while this treatment benefited cough and local congestion.

One more word, which he knew to be heterodox, but which he believed nevertheless to be true. He had had charge of a good many phthisical patients at the Out-patient Department of the New York Hos-

pital, and he could say that certainly very few of those persons having infiltration of the lungs were benefited to any considerable degree by ordinary methods of treatment.

Dr. SHATTUCK, in closing the discussion, said he cordially agreed with all Dr. Kretzschmar had said. He had found it hard to tell, in so short a paper, what to say and what to leave unsaid. With regard to what Dr. Robinson had said concerning forced feeding, he was glad to hear about it, and to know that it had been tried in New York. He had not mentioned it in his paper because he had had no personal experience with it. Inhalations and treatment with compressed and rarefied air he had left out purposely, because they were large subjects and he knew there were to be papers specially devoted to their consideration. With regard to injections into the lungs, he had read one paper on the subject by Dr. Robinson, and the impression which he got from it was that he did not do the patients any harm, but he could not say that he did them any good, and it was not pleasant to have the needle stuck into one unless it promised some good result.

Second Day—Morning Session.

Paper.

THE ANNUAL AND SEASONAL CLIMATIC MAPS OF THE UNITED STATES; WITH A RULE FOR THE EVEN DIVISION OF CLIMATE, BASED UPON THE AVERAGE OF THE COMBINED ATMOSPHERIC HUMIDITIES IN THE UNITED STATES.

BY CHARLES DENISON, M. D.

IT is not the author's intention to write a new paper for the Climatological Association this year, but simply to complete his last year's contribution by a presentation of the graphical illustration of climatic statistics and of the divisions of climate in our own country, which was an important part of his last year's report. He can thus fulfill his obligation as "Committee on Climatic Elements, etc., Acting with the Chief Signal Officer," for the maps which are presented contain the different condensations of nearly five million signal-service observations, and for temperature, rain-fall, and wind movements—all the records since the Signal-Service stations were established. The result of studying so broad an area as is included within the boundaries of the United States is very gratifying in the presentation of a variety of climates and an amplitude between the

extremes of moisture and dryness such as can hardly be claimed by any other government. Indulgence is craved for the introduction of the following descriptions of these climatic maps and the data they contain:

I. The Annual Map.—The annual map and tables are intended to give all the desirable annual averages of climatic statistics, and to graphically illustrate the most important of these—*i. e.*, the cloudiness of the air, annual temperatures, rain-fall, and wind—directions as to their prevalence and their influence upon the weather.

Cloudiness.—The relative cloudiness of the sky is one of the most important facts to be determined about the climate of different sections, for it is an estimate of the humidity of the atmosphere, which is but slightly affected by local peculiarities and the unequal radiation from the earth's surface. Particularly is cloudiness little affected by those faults of temperature statistics in cities, which are due to the greater heat there, and radiation from stone buildings, paved streets, etc. Besides, it is the most accurate estimate yet obtained of *the duration of sunshine.* The Signal-Service Bureau has no other reckoning of the time the sun shines than that obtained by inference—*i. e.*, if the sky is beclouded at two given stations thirty and sixty per cent. of the time, then the sun is assumed as shining seventy and forty per cent. of the time it is above the horizon at those places respectively. The annual average of sunshine can, accordingly, be approximated at from less than forty per cent. of day-time, in the northern Central Lake region of the United States, to more than seventy per cent. along the eastern slope of the Rocky Mountains and in southern Arizona. This is a reasonable conclusion, and in accordance with the testimony of many observers. The sunshine is, therefore, represented by one hundred per cent. minus the per cent. of cloudiness of any given section. The proportion of cloudiness is telegraphed daily to Washington from all signal stations at 7 A. M., 3 P. M., and 11 P. M., Washington time. From these telegrams for the year 1883 the percentages were obtained which are graphically illustrated by the color shades on the annual map. They are divided into six grades of color, and show the proportion of cloudiness to range from over sixty per cent. of the time (one hundred being continuous cloudiness) to less than thirty per cent. The exact per cents. for each of the 136 signal stations are given in the tables, on the border of the map. It is interesting to note a somewhat intimate relation between increased cloudiness and increase of rain-fall and relative humidity, a fact

which strengthens the belief that cloudiness is a good index of atmospheric humidity.

Temperature.—The average annual temperatures of belts of country stretching across the United States are represented by the *solid blue lines.* These *isothermal lines* are described by the figures (Fahrenheit scale) given at their termini on either coast. They are computed, according to the plan of the Signal Service, by dividing the sum of the 7 A. M., 3 and 11 P. M. observations by three to get each daily record. These isotherms represent the average of annual means for all time since the signal stations were established (for dates of establishment see annual tables), as do also the records given in the border tables for each station. The temperatures of places between isothermal lines can be approximately determined according to their nearness to the same.

Rain-fall.—The amount of rain and melted snow is accurately measured at each signal station (see Mean Precipitation in border tables), and the average yearly totals are graphically illustrated by the *interrupted blue lines* running over the face of the annual map. The inches of rain-fall are given at the termini of each of these lines on the border of the map. The variations in rain-fall within the boundaries of the United States are remarkable, being from less than five inches in southeastern California and southwestern Arizona to over seventy inches on the coast of North Carolina.

Winds.—An important part of the climatic maps to agriculturists, and to those who wish to prognosticate the state of the weather, is the record of the winds as to what winds bring pleasant weather and what usher in rain. Besides these two important facts, the prevailing direction serves to show whether pleasant-weather winds or rain-bearing winds are most likely to blow at any given place. All these three records are given by the *groups of arrows* which are scattered over the United States, the groups representing the regions in the center of or near which they are, and each kind of wind being indicated by a distinct form of arrow. These winds are the averages for the year 1882, and they blow as the arrows fly on the map, the quarter of the earth's surface, from which the pleasant-weather or rain-bearing winds come, being pretty nearly represented by the spread of the arrow's feather. *The velocity of the wind* at every signal station is constantly determined by a self-registering anemometer, and this valuable record (since the signal stations were established) is represented in the tables at the border of the annual map by the miles per month traveled by the wind.

The comparative windiness is further given as determined by these records. For instance, Pike's Peak (1) is the windiest and La Mesilla (132) the least windy of all the places where the records are complete for the year, while the average for Denver, rating her as the 95th, shows that there are 94 out of 132 stations which are more windy than the "City of the Plains."

Elevations.—The elevations given in the border tables are the distances in feet, above sea-level, of the observation stations of the Signal-Service Bureau, and are approximately accurate as representing the cities where these stations are. On the annual map the approximate elevation of sections of country are given which are over one thousand feet above the sea.

Ranges of Temperature.—Those who make a great point, as many do, of the precise variations of temperature, will be interested in the means of maximum and minimum and daily and monthly ranges of temperature, given in the border tables. The means of the maximum and minimum temperatures for 1883 are the averages of the daily highest and daily lowest temperatures for all the stations. From these two the mean daily range of temperature is computed, which is also given. The average or annual mean of monthly ranges of temperature is the average difference between the highest and lowest records in each month, and, with the daily range, indicates the equability or variability of a given climate. Many physicians, who had hitherto recommended equable climates for the classes of consumptives which can be benefited, have lately learned that *variability* is often to be preferred, as this quality pertains particularly to stimulating, dry, cool, and elevated climates, while *equability* always accompanies enervating warmth coupled with injurious dampness of atmosphere.

Relative and Absolute Humidities.—Relative humidity is the per cent. of moisture the air holds to what it would contain if it were saturated with vapor. It is always expressed in hundredths (saturation being 100), and the annual averages for all the signal stations are given in the border tables. A low average of relative humidity indicates the infrequency of fogs or dews as well as the presence of other qualities, as much sunshine and little rain, which produce a dry climate.

Absolute humidity is the real humidity of the air or the weight of vapor to a given space. It is usually reckoned in grains of vapor to the cubic foot of air. In the border tables of the annual map the annual record for 1883 is given in grains and hundredths, while

in the tables of the seasonal charts it is given in tenths of a grain of vapor to a cubic foot of air.

Dew Point.—This is the temperature at which the air will become more than saturated by the amount of vapor it contains. The annual mean dew point, which is that given in the border tables, is always lower than the given mean temperature of a place. The reason is this: the air can hold moisture according to its temperature, the range being very great—*i. e.*, from about one half a grain to the cubic foot of air at zero to over nineteen grains at 100° F. Now, the annual average of relative humidity never exceeds 90 per cent., so the temperature must be lowered for dew to be deposited. The explanation is similar considered with reference to absolute humidity. A place which has four grains of vapor to the cubic foot of air and a temperature of 62° (66 per cent.) must have its temperature reduced to 49° when four grains will just exceed saturation. The greater the difference between the mean dew point and mean temperature of a place, the less frequently do fogs occur.

Vapor Tension.—This is the elastic force of vapor, and represents the expansibility of the vapor of water the air contains. The moister the air, the greater is its elasticity or pressure. This elasticity is determined by the difference between the wet- and dry-bulb thermometers, and is expressed in hundredths of English inches (see border table for annual means). This method of expression is used because the expansibility of the air, due to the vapor it contains, is determined by the depression in inches of a column of mercury when acted on by this force.

II. The Seasonal Charts.—The seasonal charts serve a special purpose in presenting all important climatic data in quarterly divisions, which method has many advantages over the annual representation. In the annual statistics we have not even approximate representations of either summer or winter, for, being on opposite sides of the mean for spring and autumn, they neutralize each other when combined, and the significance of each is lost. The seasonal division of the year is therefore necessary in order to show the contrasts between winter and summer. It aids the mind in retaining correct impressions of separate data, while a semi-annual subdivision would be rather impracticable, and monthly statements too confusing to be remembered. The study of climate by seasons is the most satisfactory and the most rational method for physicians, agriculturists, health seekers, tourists—in fact, the great majority of those interested in climate.

Combined Humidities.—An important and peculiar object of these seasonal charts is to illustrate a classification of climates which the author has originated after much deliberation. It is that which is given in the blue and red color shades, and is based upon an equitable combination of the humidity statistics of the atmosphere for 1883. The object being to rate all sections according to their records, nearly a third the rating influence is given to each of three attributes of climate, namely, *cloudiness* and *relative humidity* per cent., and *absolute humidity* in tenths of a grain of vapor to the cubic foot of air; or, perhaps, more definitely, about 35 per cent. to the first, 40 to the second, and 25 per cent. to the third, in the order named. The object of this rating is to correct the mistake of judging by any one evidence of moisture or dryness. Cloudiness is uninfluenced by the faults of temperature or absolute humidity records taken in cities, and is comparatively independent of purely local effects; yet cloudiness is somewhat of a relative quantity, since the upper strata of the atmosphere must reach saturation in order that clouds may exist. Relative humidity would be an admirable test of atmospheric humidity were it not so fickle and under the dominion of faulty temperatures and changing winds. Absolute humidity, however, is more stable. It is an actual, *real* statement of the amount of atmospheric moisture, and serves as an excellent means of correction for relative humidity. For instance, Pike's Peak for spring, with a high relative humidity of ·84, has a low absolute humidity of nine tenths of a grain of vapor because of its low temperature, 15°; while Cedar Keys, with a less relative humidity, ·73, has a high absolute humidity—five and seven tenths grains—because of its high average temperature, 70°, for the same season. So each of these factors corrects the faults of the other two, and all of them combined better represent the climate of the country than any one of them alone can do. The finally accepted method of combining these statistics was to rate every station, forward or backward, from the average, which was assumed as the middle of climate for the United States. This mean of humidity statistics for the year would be represented by the average of the dividing lines between the blue and the red shades on the four charts. It is this yearly average with which all places are compared, those of more moisture being thrown appropriately into the shades of moisture (blue), and those opposite into shades of dryness (red). Since absolute as well as relative humidity is dependent on temperature, the capacity of the air to hold moisture varying according to temperature, it became neces-

sary to have a separate rating standard or figure for each degree of temperature. Thus the "Rating Table" and the "Rule of Moisture and Dryness" were constructed, which are given both on the summer seasonal chart and on the annual map. The rating figures represent one third the sum of the three rating factors, and with this a third of the records of every place is compared. It must be remembered that this is not a geographical mean; so it is not essential to accuracy that the moist half should exactly correspond in area to the dry half. To get a fair mean as the basis of the "Rating Table," the averages of the separate factors were determined according to methods of computation approved by those in authority to judge of this subject. These means were found to be 44½ per cent. for cloudiness, 67 per cent. for relative humidity, and 67 per cent. of saturation for absolute humidity, expressed in tenths of a grain of vapor to the cubic foot of air. By these standards combined the proper climatic rating of every locality is determined, based upon the official and unbiased records of the Signal-Service Bureau. Thus a much-needed definition is obtained of what *moisture* and *dryness* mean as applied to climates. The moist and dry halves are each divided into four equal divisions, which are respectively represented by the blue and red shades on the seasonal charts. The seasonal peculiarities of localities and the relation of seasons to each other are thus well illustrated. Instance the large area (see winter chart) in the Northwest and in the Northern Lake and Central River regions, which are thrown into the solid blue shade of the extreme of moisture by the cold of winter, and the equally large area (see summer chart) in the Southwest that is thrown into the solid red shade of the extreme of dryness by the heat of summer. Thus the laws which govern the diffusion of heat and terrestrial radiation are at many points illustrated by these charts. It is hoped this seasonal presentation of combined humidities will be appreciated, especially by those who would avoid undesirable weather in one season by a temporary removal to a more genial clime.

The rule of moisture and dryness mentioned above is stated as follows: First find for the given time and place the per cent. of relative humidity and cloudiness, and the absolute humidity in tenths of a grain of vapor to the cubic foot of air. Then compute the difference between one third of these three and the standard number given opposite the proper temperature (of the given place) in the "Rating Table," and the result, plus or minus, will show the relation of the given climate to the average for the United States. An excess

of six belongs to *moderate moisture*, and over six to *extreme moisture*, while a deficiency of six locates a place in *moderate dryness*, and over six in *extreme dryness*. On the map each of these four divisions is divided into halves, thus giving eight even divisions of the whole climate. The gradations toward the extreme of moisture or extreme of dryness are thus easily seen as the colors change from the mean of climate, which is the dividing-line between the blue and red shades.

It is claimed for this mean of climate for the United States that it is only approximately correct, because the colors of the seasonal charts do not represent a period longer than one year (1883), and because the density of observation stations in the United States is very unequal. An effort was made to counteract this latter circumstance by taking the average relative humidity of places representing about an equal area along parallels of latitude. The averages thus obtained, of 67 per cent. of saturation for relative humidity and 44½ for cloudiness, were considered by the Signal Service authorities in Washington to be about as nearly correct as could be obtained. A little too much of the country may be apportioned to the blue shades, yet, if that is the case, it makes no difference with the extremes of either moisture or dryness. Here it should be noted that the excesses, from the annual average for the whole country, on the side of dryness (red) are much more than on the side of moisture (blue). For instance, Red Bluff, California, in summer—with a cloudiness of 13 per cent., a relative humidity of 34 per cent., and an absolute humidity of 3·7 grains to the cubic foot of air, giving a mean of 28 to compare with the usual mean (62·7) in the table for Red Bluff's temperature, 82°—gives an excess on the side of dryness of 23 above the extreme of dryness, while Spokane Falls and Port Huron, Mich., two of the moistest localities in winter, give only 4 excess above the extreme of moisture. This less fluctuation on the moist side of the average of climate is in perfect accord with the greater variability of climate according to the dryness of the air. These facts, and the proofs the author presented in his last year's report, that equability goes with warmth and moisture of atmosphere, should always make us suspicious when equability is claimed for dry, cool places, or when great dryness of atmosphere is alleged for warm, equable places.

The other features of the seasonal charts are easily understood—*i. e.*, isotherms, wind-arrows, and seasonal tables—by referring to the descriptions already given and simply substituting *seasonal averages* for *annual means*.

For instance, the isotherms represent belts of country of the same seasonal average of temperature. The same winds averaged for seasons are *prevailing*, *rain-bearing*, and *pleasant-weather producing;* but, instead of representing regions, as on the annual map, they answer for each signal station near which they are placed. In the border tables the *comparative windiness* of stations is worked out from the seasonal averages of miles the wind travels a month, which latter are likewise given at the sides of the charts. Besides the seasonal averages of cloudiness, relative and absolute humidities, precipitation, daily and monthly ranges, and the 1883 seasonal averages of temperature which are given below the seasonal charts, the establishment and elevation of stations, the annual cloudiness, annual temperatures, and mean annuals of maximum and minimum temperatures are given on the sides.

The basis map of the seasonal charts contains all the signal stations, State capitals, principal cities, health stations, and all the thermal and mineral springs of note, including many as yet unnamed, and comprising the most complete list of such springs extant.

The absolute humidity table, given on the chart for autumn (see Gulf of Mexico), is added for the convenience of those who may wish to compute the standing of places not rated on the charts, while the presence of the "Rating Table" and "Rule of Moisture and Dryness" on the chart for summer gives opportunity for any one to make such computations, or to prove the color shades as given for any signal station.

It is to be explained that barometrical records, atmospheric electricity and ozone are not given for the following reasons: The uncertainty incident to the fickleness of barometrical readings, with the necessity to reduce them to a sea-level standard, is not thought to be warranted by any good that would result; while atmospheric electricity and ozone are not yet estimated, if at all, with sufficient degree of accuracy to allow of their use.

The principal feature of these seasonal charts is the illustration of the method of dividing the climate into even portions, based upon the average of atmospheric humidities for the year. If this standard of evenly subdividing the climate of our own country shall be accepted as the rule by the Climatological Association until a better is submitted, the author will feel amply paid for his labor in working it out and presenting it to the medical profession.

Discussion.

The PRESIDENT had received the maps three or four months before, and had spent some time, but perhaps not sufficient to express an opinion, in examining them. It seemed to him that Dr. Denison had endeavored to put too much on the maps, and they were confusing, to say the least on that account. That was the only criticism which he had to make with regard to them. How reliable the observations made were, he supposed was only to be determined by the accuracy of the signal stations observations. With regard to the final deductions which the author made, he thought, as stated in his address, that humidity which was prejudicial to phthisical patients had more to do with the soil than with the general atmospheric condition, and therefore it would be necessary to know more of the soil of the different localities that were supposed to be specially favorable for phthisical patients before he should be willing to express an opinion. He believed that all of the gentlemen who had been the most correct in the matter of climate, starting with the observations of Dr. Bowditch in 1862, agreed that dampness of the locality due to the condition of the soil played an important part in the development of phthisis. It was not the amount of rain-fall, nor the amount of relative humidity, but the want of free drainage in the soil. Dr. Bowditch, in his address before the Massachusetts State Medical Society, had dwelt upon this point very strongly and very clearly. When the speaker first went into the Adirondack region as an invalid it seemed to him that everything was against its being a suitable place for phthisical patients so far as humidity, changes of temperature, and all that was concerned; but the results had proved that it was a good place for phthisis—certainly in the earlier stages, and the principal reason was the condition of the soil. There was no clay in the Adirondack region, and everywhere there was quick drainage.

Dr. A. N. BELL remarked that the maps which Dr. Denison had prepared to show the relative moisture and dryness in different parts of the United States, with a view to enabling physicians to decide where to send their phthisical patients, went far to counteract the position which Dr. Denison started out with, that dryness was the essential element in the cure of phthisis. Studying these maps, and the reports on which they were based, we found some curious facts. In Colorado, for example, the ratio of mortality from consumption to the mortality from all causes varied only a small fraction of one per cent. from that of Florida, Mississippi, and Louisiana, exclusive of New Orleans, where there were just reasons why the mortality from phthisis should be excessive. It was considerably higher than in Texas, which also had a damp climate. What the president had said with regard to the Adirondack region had an equal bearing on the subject. Everybody knew that forests were the storehouses of moisture, and, so far as we could go in measuring these climates, they were exceedingly damp, and for manifest reasons—not only because of the large amount of rain-fall, but also because the leaves inter-

fered with evaporation. It had also been shown that there was something besides heat, as well as besides relative dryness, which had an important influence on the consumptive. We might refer to the statistics of the navy. It would be said that the men in the navy were picked men, but that fact might be offset with the further fact that they were of the age when phthisis was most likely to develop, seafaring men usually occupying bad quarters for sleeping. The ratio of deaths from phthisis in the navy to deaths from all other causes was 6·3 per cent., while in Colorado, Florida, and Mississippi the ratio was 8+per cent. In Texas, Arkansas, and Arizona it was about 6 per cent., or nearly the same as on the ocean. According to English statistics, the mortality from phthisis was ten times less on the ocean than on land; if allowance was made for the seaman's age, from fifteen to forty-five years, it was sixteen times less. The rate of mortality from consumption among all classes who lived on the water in this country, including canal and river men, and their wives and children, was less in comparison with the general mortality than that of several of the New England States. Consumptives on land, subjected to like conditions, would certainly die much faster. More than thirty years ago he had kept records of the mortality occurring on vessels on the west coast of Africa, and found that the number of deaths from phthisis was greater at a given locality where the atmosphere was dry than at points where there was greater moisture, which went to show that moisture alone was not the cause of greater mortality among the phthisical. An atmosphere containing clean moisture was by no means necessarily promotive of consumption. If one wished to experience the full benefit of the Adirondack region he should go into it, and not remain on its outskirts. There one would get the benefit of free drainage, atmospheric agitation, electrical change, and a bountiful supply of ozone, equal to that developed by the action of the waves on the seashore. He had examined the maps prepared by Dr. Denison very carefully, and, while he held in admiration the industry displayed by the author, he certainly was far from being willing to accept his suggestion to make excessive dryness, to say nothing about altitude, the test of climate for consumptives.

Dr. Reed was glad to hear the vigorous protest of Dr. Bell against the suggestions offered by the author. When Dr. Denison read his paper last spring he (Dr. Reed) had entered his protest against accepting his conclusions. He thought it was so generally admitted by the profession that ocean air, either on shipboard or at the sea-coast, was beneficial to consumptives that there ought to be no longer any question about it. It had been a known fact among physicians since the time of Hippocrates, and had never been questioned until recent years, when it had become the fashion to talk about dryness as the only standard. He had been glad to hear the explanation by the president of the importance of dryness of the soil. Against the idea that dryness was the only important factor he could place his observations at Atlantic City, where patients suffering

from phthisis, particularly in the first stage, and often in the second stage, did very well. These maps, which showed elaborate work and were unquestionably valuable, also contained conclusions which required restrictions. They could not be accepted as proof positive. Regarding the statistics of the English navy referred to by Dr. Bell, in a paper which Dr. Reed read last spring he had given some of the records of both the navy and army of England, which were to the point. Of course the men in both the army and navy were equally picked men and it was a striking fact that, while there was quite a fair proportion of deaths from phthisis in the army, in the navy, if he remembered correctly, the mortality from the same cause was not more than a third as great. The only way to account for this greater mortality from phthisis in the army was that the men were on land, while those in the navy were most of the time at sea.

The PRESIDENT remarked that it was evident the association was not willing to indorse Dr. Denison's position, and it was hardly necessary to take a vote upon it.

Dr. TYNDALE, the reader of Dr. Denison's paper, stated that the author's contention was that the principal features of climate related to dryness, elevation, and equability of temperature. Statistics had thus far shown that, of these three, dryness was the most important, and equability next, elevation being third, and not separable from dryness.

[NOTE BY THE AUTHOR.—The author wishes to add a word or two in reply to those who took part in the discussion. First, with reference to the president's criticisms. A considerable number of physicians, whose opinions are most trustworthy, have critically examined the charts and have not found them at all confusing, when applying the given explanations to the colors, lines, arrows, etc., illustrating separate data.

The comparatively favorable Adirondack region was not differentiated on the seasonal charts, because the Signal Service had no station there. Undoubtedly the freedom from soil-moisture and the "quick drainage" would so have made its impress upon the humidities of the atmosphere as to have brought out this region into one of the light-red colors of moderate dryness. The qualities which the president mentions as favorable—porosity of soil, "quick drainage," and, in fact, all the soil conditions which produce a pure atmosphere—extend over large areas in the United States. These regions, because of their atmospheric dryness, are thrown into the deep-red shades on the seasonal charts; on the other hand, the dark-blue regions, showing atmospheric moisture, indicate a general preponderance of opposite soil characteristics. Therefore, for large regions, the character of the soil, in a great measure, determines the atmospheric humidities. Conversely, the humidity colors, to a certain extent, represent soil conditions.

The president's statement that the author's position is not indorsed is unfair, since the whole discussion, with the above-mentioned exception, was irrelevant to the subject of the paper read—namely, *the even divisions*

of climate. The question is, Are the divisions of climate fair, and the extremes on the charts worked out with justice to the sections of our country which are put in opposition to each other?

The discussion seems to have been wholly confined to the therapeutics of climate, which the author did not intend to introduce in this paper. As to his previous writings he has nothing to retract; nor has he ever said that dryness was the "*only*" important factor in climate. If, however, he were to mention the principal features of climate, for the arrest of phthisis, in the order of their importance, he would give them as *dryness*, *coolness*, *sunshine*, and *elevation*, not mentioning *equability* at all, for he would expect to find a due amount of *variability* with these favorable attributes.

Provided he is present at some future meeting of the assocaition, he would be pleased to discuss the subject introduced by these gentlemen. Perhaps the following title will best comprehend the questions in dispute, *i. e.*, *The comparative importance of different climatic attributes in the arrest of phthisis.*

However, there were two statements made which should not go uncorrected, notwithstanding they are foreign to the discussion of the author's proposed divisions of climate. With reference to Dr. Bell's argument, mortality statistics from consumption are inadmissible as settling the salubriousness or injuriousness of given climates, because of the migration of pulmonary invalids in search of health. For instance, if statistics of mortality from pulmonary tuberculosis alone are taken, probably not over five per cent. of such deaths in Colorado have been from disease which originated in the State. The author has written many certificates of death from phthisis—probably a hundred and fifty, and perhaps more—during his twelve years' residence in Denver, but he does not remember to have written one for an uncomplicated case which originated in Colorado. A brother physician suggests that one might as well assert that all the cases of syphilis at Hot Springs, Arkansas, originated there.

That sea-air is healthful, and the mortality among seamen is small, is not at all to be wondered at, since the analyses of the air by Miquel, at the Observatoire de Montsouris, near Paris, have shown that the air out at sea is next in freedom from bacteria to that of elevated regions. Therefore if, in addition to this purity of sea-air, the consumptive mortality among seamen—some six per cent.—is about equal to that in Texas and Arizona, where many invalids go, then the better—the dryer and more elevated—portions of those States must indeed furnish a very pure atmosphere, and one which is especially suited to the consumptive's needs.

If Dr. Reed's statement, that the maps "contained conclusions which required restrictions," does not indicate a determination to shun the inevitable logic of facts, it is at least very vague. There are no "conclusions" on the maps except the arithmetic of climatic data—the condensed and graphical illustration of the work accomplished by the Signal Service

Bureau. Why should not the conclusions of facts be allowed to have full sway in the judgments of medical men who are able to appreciate their bearing? In fine, with reference to a many-sided question like the one introduced, is it not through the largest collection of facts and climatic data that the physician can have any reasonable grounds from which to draw conclusions? And is it not a mistake to try to determine those conclusions from an experience which is limited to sections which are within a hundred or so miles of New York city?]

Paper.

A REPORT ON THE ORIGIN AND GEOGRAPHICAL DISTRIBUTION OF PHTHISIS PULMONALIS FOR THE STATE OF MICHIGAN.

By E. L. SHURLY, M. D.,

Mr. President and Gentlemen: The object of the investigation upon which this imperfect report is based is to ascertain, if possible, what, if any, influence is exerted by strictly telluric environment upon the causation of phthisis pulmonalis. The aërial and social factors of its ætiology have been for a long time freely and widely discussed, but the telluric aspect and geographical distribution, according to my observation, have received much less consideration, and perhaps deservedly, although it seems to me that we have too little knowledge on this point to warrant such a decision.

Circulars were sent out to the profession of the State of Michigan asking for data relating to the number of cases of phthisis pulmonalis which had *originated* only in the township or county where the practitioner resided, together with a statement of the number of such patients who were known to have hereditary predisposition, and whether primary or secondary. Although a large number of replies were received, I regret to say the number was somewhat less than I had hoped for.

As the number of physicians who keep notes of cases is small in the aggregate, I endeavored to shape the queries as concisely as possible, and to ask for so little that almost any practitioner could fill out the answer from memory and with the consumption of very little time. To those who were good enough to reply I feel greatly indebted, and I believe all who are interested in this subject will also share in this feeling.

I thought it advisable, even at the risk of wearying you, to precede the tables with a few extracts from the reports of Professor Winchell and Dr. Rominger, showing the topography of the State.

I am greatly indebted to Dr. A. W. Nicholson, lately of our State Board of Health, for the general and census tables, and to Dr. Erwin Wright for the preparation of the other data in the form presented.

Topography, Hydrography, and Geology.

"The two natural divisions of the State are distinguished by marked physical characteristics. They are completely cut off from one another by the Straits of Mackinac. The northern is rugged, with numerous rocky exposures; the southern consists of plains, plateaus, gentle undulations, and moderate hills, with very few outcrops of rocky strata. The northern peninsula is a mineral region; the southern, agricultural. The climates of the two peninsulas are as distinct as their location and topography."

"The climate of Michigan, both in summer and winter, is well adapted to the interests of agriculture and horticulture. Its marked peculiarity is attributable to the influence of the great lakes by which the State is nearly surrounded. It has long been known that considerable bodies of water exert a local influence in modifying climate, and especially in averting frosts; but it has never before been suspected that Lake Michigan, for instance, impressed on the climatic character of a broad region an influence comparable with that exerted by the great oceans."

"The influence of the sea in equalizing temperatures has long been understood. The immunity from unseasonable frosts secured by bodies of fresh water to localities in their immediate neighborhood has also been universally observed; but the fact that inland lakes of the size of Lake Michigan exert an ameliorating agency quite comparable with that of the Atlantic Ocean is something which has only been brought to light by recent thorough discussion of a wide range of meteorological data."

Distribution of Precipitation through the Seasons in Percentages of Total Percipitation.

	Spring.	Summer.	Autumn.	Winter.
Upper Peninsula	19·0	27·0	28·8	22
Lower Peninsula	25·8	28·7	27·3	19
Whole State	23·8	28·3	27·7	20

It appears that the northern localities experience a somewhat greater liability to dryness in all seasons. It must be borne in mind, however, that the percentages given are percentages of the seasonable means.

"A general glance at the superficial configuration of the lower peninsula reveals a surface swelling gently from the shore toward the interior regions."

"Generally the lake shores are depressed."

"The rise of the peninsula from the level of the lakes is generally gradual, and in a few places only is it abrupt. The surface is of an undulating, hilly character; the hills are rounded, and never attain a very great height above the surrounding country. The southern peninsula is lower than the northern. The swell of the land forming the water-shed of this southern division coincides with a line drawn in a southwest direction from Port Austin, at the entrance of Saginaw Bay, to the southwest corner of Hillsdale County, where it enters the boundaries of the State of Ohio. Within the limits of Tuscola and Sanilac Counties the known surface elevation of this water-shed is about four hundred feet, while in Hillsdale, not far from the southern State line, some points with an elevation of six hundred feet are recorded; but the water-shed is probably not over five hundred feet high."

"This, which may be called the southeastern water-shed, is not broken through by any of the streams, though deeply excavated by the Huron River in Washtenaw County."

"The descent from the height of the water-shed to the lake shore is so gradual that a traveler in crossing the peninsula from either lake to the other, if he follows the river valleys, can scarcely perceive it. The northern division of the peninsula rises to nearly double the height of the southern part; its surface is more broken and diversified by steeper ascents from lake to terrace. Its highest points in the vicinity of Otsego Lake are, according to the records of the railroad surveys, eleven hundred feet from the lake level. Otsego Lake lies directly west of Thunder Bay, and not far from the northern terminus of an extensive high plateau with undulating surface, and an average elevation of from seven hundred to eight hundred feet."

"All the rivers of the northern part of the peninsula have their source within this plateau, which is dotted with a number of inland lakes, some of which, like Lakes Higgins, Houghton, and St. Helen's, are of large size. The terraces by which the descent from the plateau is made form a succession of broad belts; their sides are moderately steep and finely timbered; the lowest are wider, gradually slanting toward the shore, or overlooking it in bluffs of from forty to sixty feet."

In some places on the west side the bluffs are from one hundred to two hundred feet high, and Sleeping Bear Point, a promontory facing Lake Michigan west of Big Traverse Bay, is said to have an elevation of five hundred feet. Opposite this point, twelve miles out in the lake, the Manitou Islands rise abruptly to a height of two hundred feet above the water. South of the second correction-line the plateau rapidly declines toward Saginaw Bay. Between the north and south parts of the peninsula a depressed strip of land extends from Saginaw Bay to the mouth of the Grand River on Lake Michigan, having rarely more than one hundred feet elevation.

An astonishing number of smaller and larger inland lakes are found in every part of the peninsula; all have crystal-clear water, and the principal supply of the head branches of our rivers comes from them. The more important rivers collecting the waters of the western slope of the peninsula are the St. Joseph's, Kalamazoo, Grand, Muskegon, and Manistee. The three first named have their sources in close proximity to the elevated lands of Hillsdale and Jackson Counties.

From the same swell of land the River Raisin emanates, flowing outward into Lake Erie. The Raisin River enters the lake near Monroe; it drains the southern part of Washtenaw County, and draws its branches from a number of small lakes in the southeast corner of Jackson County through its main north branch. The south branches have the drainage of Lenawee County.

The St. Joseph's, Kalamazoo, and Grand Rivers almost touch each other within the small area of a few square miles in the County of Hillsdale. The St. Joseph's River originates in a number of small lakes and marshes in Hillsdale County, and enters Lake Michigan at the village of St. Joseph.

The streams which form the head-waters of the Kalamazoo River rise in Hillsdale County. The river runs north, west, and northwest, and falls into Lake Michigan near Saugatuck.

Grand River springs from a few lakes in Jackson County; it runs north and opens into Lake Michigan near Grand Haven.

Huron River collects its waters from innumerable lakes and marshes in Livingston and Oakland Counties, flows southwest, and at Dexter turns southeast and retains this direction until it enters the Detroit River in the northeastern corner of Monroe County.

Clinton River drains the eastern part of Oakland County and all of Macomb County, entering Lake St. Clair near Mount Clemens.

Black River is remarkable for its southern course for nearly fifty miles parallel with Lake Huron, at a distance of only five or six miles from it. It begins in the northern part of Sanilac County, and enters St. Clair River near Port Huron.

Saginaw River is the receptacle of a whole system of rivers. By the Tittibawassee River the waters of the north and west are led into it. The Shiawassee collects from the south, the Flint River from the south and southeast, and finally the Cass River brings its waters from the northeast and east.

The river system of the northern part of the peninsula consists of the following rivers: Commencing at the southeast side, we first find the Rifle and Aux Grès Rivers, which drain the southeastern shore-belt surrounding the before-mentioned high plateau. Au Sable River is the next largest river north of them. It draws its branches right from the high plateau, and drains Otsego in the north end of it.

Thunder Bay River, opening into Thunder Bay, spreads its arms north, west, and south, reaching the foot of the high plateau. The Cheboygan River on the north of the peninsula forms the outlet of three large lakes—Black, Mullet, and Burt. These lakes are fed by rivers of good size. On the west side of the peninsula two large rivers deserve to be mentioned.

Manistee River originates very near the head-waters of the Au Sable River on the east side. Its mouth is at Manistee.

Muskegon River is larger than Manistee; its branches extend to the top of the central high plateau, and are fed by Higgins and Houghton Lakes. Of all the rivers mentioned, none are navigable. The water-power afforded by these rivers is ample, and those the branches of which flow through timbered lands are of vital importance to the lumber business as mediums for the transportation of felled timber from otherwise almost inaccessible parts of the interior to ports or railroad stations.

Relief Features in the Lower Peninsula.

SOUTHERN LOBE.

Northwestern slope.	Livingston Summit	350	feet.
	Ingham Summit	391	"
	Grand Ledge Summit	250	"
	Barry Summit	250	"
	Kent Summit	213	"
	Cass Summit. Oshtemo culmination	349	"
	Cass Summit. Cassopolis culmination	384	"

Southeastern water-shed.

Oakland Summit		539 feet.
Washtenaw Summit		394 "
Francis County Summit		411 "
Hillsdale Summit.	Somerset culmination	600 "
	Cambria culmination	613 "
	California culmination	546 "

NORTHERN LOBE.

Roscommon Summit	820 feet.
Clare Summit (central water-shed)	750 "
Ogemaw Summit	850 "

Southern Division.

Crawford Summit	700 "
Wexford Summit	700 "
Osceola Summit	700 "

Northern Division.

Oscoda Summit	800 "
Otsego Summit	1,200 "

The rivers have all eroded their valleys into the loose drift masses which almost universally cover the surface of the peninsula in great thickness. Only in rare instances have they been deep enough to touch the solid rock ledges below the drift, or, if such deep cuts did exist, they have filled them up with *débris*, and the beds of the present streams lie high above those of former times. The peninsula was, in its original condition, heavily timbered, with the exception of a few marshy flats. Climate and quality of the soil determine the character of the vegetation. In the southern part of the peninsula deciduous trees, particularly hard-wood timber, prevail. Pine is only sporadically intermingled. The mildness of the climate favors the growth of the oak, hickory, walnut, poplar, etc., which abound here, but become rarer farther north, where beech, maple, and birch take their place. The sandy soil of the central high plateau is most congenial for the growth of pine forests, which have taken possession of nearly the entire district. The marshy condition of some other places adapts them for the tamarack, elm, asp, and willow trees, or for the growth of the cedar, while a few parts of the high plateau, proving too sterile even for the pine, afford sustenance to nothing more than a stunted scrubby growth of *Pinus banksiana*, and a few creeping herbs which attempt to hide the barrenness of the scene. Such barrenness has, in some instances, been caused by fires which annihilated forests of large area, totally denuding the surface, and leaving it exposed to the burning rays of the sun and to the exsiccating winds, and unable

for a long time, if not for ever, to recover its former well-timbered condition.

"The entire surface of the peninsula is covered by heavy drift deposits, with the exception of a few limited localities in which the drift, subsequent to its deposit, has been washed off by the floods, or by rivers curving their course deep enough to touch the rock-beds of older formation. These drift masses are almost the same as those of the upper peninsula. The material has been changed somewhat, by the admixture of rock-*débris*, from the formations encountered by the moving glaciers in their southern course. The glacier drift spreads itself in a compact body over the entire surface of the lower peninsula, in evidence of which fact the rock-beds, wherever they are found denuded and the nature of the rock has been capable of preserving the marks, bear the traces of its motion on their scratched surface. Not all the drift material found on the lower peninsula has been transported there by glaciers; a large portion of it must have been carried southward by water, partly in suspension—as mud and sand—partly frozen with floating ice—as the coarser material, the gravel and the bowlder.

"The glaciers deposited moraines—heaps of rubbish composed of all kinds of rock-*débris* in every degree of comminution, from the large bowlder down to the impalpably fine clay.

"Much of the drift is not found in this orderless form of moraines, but is disposed in well-stratified layers, assorted, according to the weight of its particles, by water-currents."

A long time of submergence of the land must have followed the glaciers. The surface of the highest points of the peninsula, 1,100 feet above the level of the lakes, is formed by stratified drift-sand, mixed with pebbles.

"The older glacier-drift and the later deposit of floods and ice-bergs are materially of the same composition; both are made up of clay, sand, gravel, and bowlders of detritus from crystalline and metamorphic rocks, mixed with *débris* of younger sedimentary strata."

The coarse bowlder-drift all through the southern part of the peninsula appears not to occupy the lowest position, in which most frequently a hard, dark blue, sandy clay, with pebbles and some bowlders intermingled, is found in layers of considerable thickness. It is known among laborers by the popular name of hard-pan.

"Bog-iron occurs very frequently in small patches of marsh lands in all parts of the State."

"As another surface deposit, peat has been mentioned. Innumerable larger and smaller patches cover the swampy surface depressions throughout the whole State."

The soil of the lower peninsula, being a drift-soil, is generally very deep, and contains all the chemical constituents of a good soil.

The assortment of the drift-soil into clay, sand, and gravel determines its character as the layers happen to occupy the surface positions, while by intermixture a great variety of intermediate shadings in the quality of the soils is locally produced under atmospheric influences. The distribution of soils over the State is sometimes very unequal and changeable, so that within limited areas, and often within single farms, a number of variations in the character of the soil are represented. But with the differences seen in the surface configuration of certain districts is also usually found a corresponding contrast in the quality of their soil. The high plateau in the northern part of the peninsula has its peculiar soil, a thick, uniform mass of fine sand, containing few pebbles and a small proportion of argillaceous constituents. In accordance with it is its vegetation; the pine-tree finds a congenial home in these sandy hill lands, and their surface is overgrown with splendid forests of this tree, to the exclusion of almost every other kind.

"Other districts—represented by lowlands adjoining the lakes, and, to all appearances, within comparatively recent times parts of the lakes' bottoms—are covered by a stiff clay soil overgrown with elm, ash, and kindred trees, as, for instance, the lower part of Saginaw Valley and a strip of land bordering Detroit River, from Monroe up to Lake St. Clair.

"The climate of the peninsula, which is the other principal factor in its productiveness, is over the whole extent temperate, extremes of heat or cold being prevented by the surrounding lakes. From the northern to the southern end all the cereals can be planted with little risk of failure. The northern part is somewhat cold, its vegetation coming out two weeks later than in the south, and the winter setting in that much earlier, which affects somewhat the raising of the more tender fruit crops, as grapes, peaches, etc.

"The grape and the peach do well in the southern part of the State, and particularly near the shores of the great lakes, where the foggy, humid air prevents late frosts, the greatest enemy of these fruits. The west shore up as far as Muskegon has become famous for its peaches and other small fruits."

"Beneath the drift the peninsula is underlaid by regularly strati-

fied rock-beds, in undisturbed horizontal position, which represent the upper part of the palæozoic strata."

DEATHS BY PHTHISIS PULMONALIS IN THE STATE OF MICHIGAN.

Record by Counties.

COUNTY.	Population in 1870 and 1880.	No. of deaths from phthisis from 1869 to 1882.	No. originating in county.	Primary	Secondary.
Alcona	766 & 3,107	155	11	2	
Allegan	32,093 " 37,815	506	5	3	2, '83–'84
Alpena	2,756 " 8,780	58			
Antrim	1,985 " 5,237	37			
Baraga	1,804	17			
Barry	22,204 & 25,317	332			
Bay	15,820 " 38,081	415			
Benzie	2,148 " 3,433	45	4	..	'81–'84
Berrien	35,119 " 36,785	602	4	3	1, '82–'84
Branch	26,229 " 27,941	467	15	13	2, '80–'84
Calhoun	36,571 " 38,452	653	23	12	4, '80–'85
Cass	21,097 " 22,009	308	9	..	'78–'84
Charlevoix	1,724 " 5,115	63	3	2	'82–'84
Cheboygan	2,197 " 6,524	30			
Chippewa	1,690 " 5,248	63			
Clare	266 " 4,187	22	3	1	'82–'84
Clinton	22,852 " 28,100	348			
Crawford	1,159	2			
Delta	2,441 & 6,812	43	6	6	'60–'70
Eaton	25,164 " 31,225	450	29	18	5, '70–'85
Emmet	1,211 " 6,639	84			
Genesee	33,965 " 39,222	515	32	2	'81–'84
Gladwin	1,127	3			
Grand Traverse	4,443 & 8,422	65	3		'80–'84
Gratiot	11,809 " 21,936	180	13	63	'70–'84
Hillsdale	31,691 " 32,723	577	19	10	9, '79–'85
Huron	9,049 " 20,489	135			
Ingham	25,270 " 33,676	424	2	1	'82–'84
Ionia	27,676 " 33,872	469	100	16	1, '57–'84
Iosco	3,175 " 6,873	56	5	2	3, '75–'84
Isabella	4,113 " 12,159	172			
Isle Royal	55				
Jackson	36,042 & 42,031	550			
Kalamazoo	32,063 " 34,342	618	15	12	3, '70–'84
Kalkaska	424 " 2,937	12			
Kent	50,410 " 73,253	1,114	28	16	2, '69–'84
Keweenaw	4,209 " 4,270	27			
Lake	548 " 3,232	22			
Lapeer	21,345 " 30,138	314			
Leelenau	4,577 " 6,253	81			
Livingston	19,417 " 22,251	324	98	68	15,'56–'84
Lenawee	45,503 " 48,343	693	35	9	17,'70–'85
Michilimackinac	1,716 " 2,992	44			
Macomb	28,050 " 31,627	544	8	4	3, '68–'85
Manistee	6,074 " 12,532	109	30	13	17,'72–'84
Manitou	891 " 1,334	11			
Marquette	15,077 " 25,394	258	10	10	'81–'85
Mason	3,266 " 10,065	87			

DEATHS BY PHTHISIS PULMONALIS IN MICHIGAN.—(*Continued.*)

COUNTY.	Population in 1870 and 1880.	No. of deaths from phthisis from 1869 to 1882.	No. originating in county.	Primary	Secondary.
Mecosta	5,645 & 13,973	122	21	9	5, '82–'84
Menominee	1,894 " 11,987	25	1	1	'80–'84
Midland	3,383 " 6,893	80	13	4	1, '80–'84
Missaukee	1,553	5	4	2	'64–'80
Monroe	27,534 & 33,624	470	30	19	11,'82–'84
Montcalm	13,642 " 33,148	295	36	14	20,'71–'84
Montmorency	....				
Muskegon	14,895 " 26,586	251	49	39	10,'74–'84
Newago	7,292 " 14,688	107	10	4	6, '80–'84
Oakland	40,906 " 41,537	618	65	35	13,'74–'84
Oceana	7,222 " 11,699	160	5	2	3, '80–'84
Ogemaw	1,914	6			
Ontonagon	2,846 & 2,565	34	2	..	2, '77–'84
Osceola	2,104 " 10,777	62	15	14	1, '72–'84
Oscoda	467	1			
Otsego	1,974	2			
Ottawa	26,665 & 33,126	455	6	..	2, '83–'84
Presque Isle	3,113	14			
Roscommon	355 & 1,459				
Saginaw	39,078 " 59,095	915	62	25	30,'78–'84
Sanilac	14,565 " 26,341	250	14	9	2, '72–'84
Schoolcraft	1,575	9			
Shiawassee	20,864 & 27,159	307	15	5	10,'81–'84
St. Clair	36,687 " 46,197	572	29	18	11,'66–'84
St. Joseph	26,274 " 26,626	430			
Tuscola	13,721 " 25,738	247			
Van Buren	28,735 " 30,807	478	9	6	3, '79–'84
Washtenaw	41,442 " 41,848	683	13	7	6, '78–'84
Wayne	119,054 " 166,444	4,237	396	237	85,'75–'84
Wexford	650 " 6,815	45			

In the foregoing report it will be seen that under the heading of County is given the name of each county; under the heading of Population is given the population by counties in 1870 and 1880, and under the heading of Number of Deaths by Phthisis is given the total number of deaths from phthisis from 1869 to 1882, inclusive. The column marked Number of Cases originating in County gives the cases reported to me from various physicians as having originated in their county, with the year of their appearance. Of these, the remaining columns, marked Primary and Secondary, will show the number of cases as far as known which were primary, and those which arose secondarily to some other malady.

It will be seen by these tables that the whole number of deaths from phthisis pulmonalis, as reported to the State Board of Health, from 1869 to 1882 (thirteen years) is 22,103, or an average of 1,700 a year. Of these, 1,241 were reported in 1869 and 1,979 in 1882.

During 1882 rain fell 179 out of the 365 days, with a total fall of 30·31 inches, which was about the average fall for the preceding ten years. The mean temperature for 1882 was 51·2, which was slightly higher than the average for the preceding ten years.

The whole number of cases reported to me as having originated in the State between the years 1857 and 1885 is 1,370, and of these, 673, or nearly one half, were reported as primary, while 205 were reported as having been secondary to some other disease.

Of the total number of original cases (1,370) from 1857 to 1885, 602, or a little less than one half, occurred between the years 1879 and 1885, or during a period of six years.

The total population of the State, according to the census, in 1870 was 1,184,059, and in 1880 was 1,856,100, showing an increase of 672,041; so that proximately, so far as learned, the percentage of deaths from original cases to population would be about $\frac{7}{100}$ per cent., which no doubt is somewhat below the truth; but, as before remarked, these statistics are necessarily inaccurate (as are all United States vital statistics). However, if enough has been elicited to awaken an interest in the further investigation in this line, the work may not prove entirely valueless.

Note.—A very full and able account of the climate and topography of Michigan, illustrated by numerous maps, by Dr. H. F. Lyster, of Detroit, may be found in the "Report of the Michigan State Board of Health," for 1878.

Paper.

THE TREATMENT OF LARYNGEAL PHTHISIS.

By E. FLETCHER INGALS, M. D., Chicago.

At a meeting of the American Laryngological Association in 1883 I presented a paper on the subject of the treatment of laryngeal phthisis. The views I then held have been but little modified by my subsequent experience, and I can hope to offer very little that is new to those who have read it. However, the malady is one of so distressing a character that it merits constant effort in seeking means for its relief. I, therefore, have yielded to the request of the secretary to present the subject at this time, with the hope of eliciting a discussion in which much may be brought out that will prove mutually advantageous to us and to those who may hereafter come under our care.

In what I have to say I purposely confine myself to a few sug-

gestions concerning treatment alone, ignoring the entire subject of pathology, ætiology, and diagnosis of the disease.

I gave in detail, in my former paper, the history of several cases, in which I endeavored to illustrate the methods which, in my experience, had proved most successful in meeting the following indications, viz.:

1. The relief of pain.
2. The cure of the disease.
3. The prolongation of life, if the disease could not be cured.

For the relief of pain I have had more satisfactory results from the use of a pigment consisting of morphine, gr. iv; carbolic acid, gr. xxx; tannic acid, gr. xxx; glycerin and water, āā ʒ iv, than from anything else I have ever tried. It will usually benumb the parts for from twelve to thirty-six hours.

In the intervals between the applications of this pigment, sedative powders may be employed with benefit. Sometimes great relief may be obtained by allowing the patient to use the pigment at home in the form of a spray, first diluting it with two or three parts of water, or even employing it in full strength when we find that it is used properly; thus applied, it relieves the pain and checks cough.

In mild cases, a sedative powder—consisting of morphine sulphate, gr. j–ij; benzoin, gr. xx; bismuth subnitrate, gr. xx; iodoform, gr. xx—may be used by the patient, and even in severe cases it will sometimes be found very beneficial. Powders may be applied directly to the larynx by means of a bent tube, or, in cases where the throat is very sensitive, they may be thrown through the nares with an insufflator, providing they are blown in with considerable force at the moment of a deep inspiration. In about half the cases where this method is tried the application to the larynx will be thorough and satisfactory.

For the cure of the disease, in the early stage when there is simple hyperæmia, the ordinary topical applications for chronic laryngitis seem beneficial; and, even later on, we may hope sometimes to check the progress of the disease by the same remedies, thus preventing the distress incident to extensive ulceration and exfoliation of the cartilages.

At the time I prepared my former paper I had hope for much benefit, in the ulcerative stage, from the application of eucalyptol by means of a brush or a spray; but my expectations have not been fulfilled, although I have found it useful in a few cases.

While great reliance is placed on local treatment, the constitu-

tional malady, which is present in most, if not all, of the cases of laryngeal phthisis, should not be neglected. This requires the same treatment as uncomplicated pulmonary consumption, and a cure of the local affection can hardly be hoped for unless the pulmonary disease can be checked, although life may be prolonged by local applications for the relief of pain. In cases where death is inevitable I follow still the general line of treatment already suggested, which was clearly marked out in my former paper, and the results are very satisfactory. Two patients whom I reported cured in 1883 are still well. One, Dr. J. C. G., who was reported as declining in health, died four months afterward from hepatic disease, which caused excessive enlargement of the liver, but he had no return of the laryngeal affection.

Sometimes the epiglottis or the arytæno-epiglottic folds become the seat of the ulcerative process. There is then likely to be so extensive a destruction of the tissues that the glottis can not be properly closed in deglutition. In such cases food and fluids pass into the larynx and give rise to such severe paroxysms of cough or suffocation that patients will abstain from food for days rather than endure the agony sure to follow any attempt to swallow it. Under these conditions topical applications can do very little, unless feeding is carried on through a stomach-tube. In other cases, where the ulceration has not selected these parts or advanced to such a degree, much can be done to prolong life by the use of some local application to benumb the parts and enable the patient to eat with comfort. For these the pigment of morphine, carbolic acid, and tannin has proved most beneficial.

From the new anæsthetic, cocaine hydrochlorate, I hope for good results; but my experience in its use has been so limited that I can not speak with authority. Thus far its cost has prevented thorough experimentation. Applied in a strong solution of from ten to twenty per cent., with a brush or as a spray, directly to the part, it will probably efficiently relieve pain for a few minutes, or for a time sufficiently long to enable the patient to partake of a hurried meal with some degree of comfort. However, the great objection to its use in this manner is that, in most cases, it is impossible for the physician to be in attendance at the right time three times a day.

The addition of the cocaine to the sedative powder already mentioned would doubtless add to its efficiency, and would furnish an anæsthetic which might be applied by the patient either directly to the larynx or, in the manner spoken of, through the nares.

The combination of cocaine, gr. j, with gr. ix of powdered starch I have recommended to be employed in this manner. I have given the powder for home use in but one instance, and then in the proportion of only two per cent. The patient reported that it did no good whatever. Its failure was probably due to the fact that so small a proportion of the drug was used.

Lack of time has compelled me to confine myself in this paper to my own experience; but I hope that what I have said may call out the personal observations of others, which will be far more valuable than anything I could compile on the subject.

Note.—Since the foregoing was written, I have several times employed cocaine hydrochlorate in laryngeal phthisis, but the results have been unsatisfactory in every case, except in reducing the swelling of arytæno-epiglottic folds.

Paper.

THE PROBLEM OF ACCLIMATIZATION.

By ISAAC HULL PLATT, M. D.

ALTHOUGH the subject of acclimatization is a long-vexed one, and has led to much discussion from the various standpoints of the biologist, the anthropologist, and the physician, it appears to be in a very unsettled condition in the scientific mind, both as regards the limits of the changes classed under that head and the physiological laws by which they are governed.

This seems to be due, in a great measure, to the fact that the subject has never been approached in the light which the advance in the sciences of biology and anthropology in recent years is capable of affording.

While I have no new facts to offer, and no personal observations to record, it has occurred to me that a few suggestions in relation to the lines of thought by which the subject may be approached would not be out of place, nor devoid of interest to us, as students of medicine and climatology, and might, perchance, serve as a ferment in some mind more capable of the task to set in operation processes of thought and observation tending to the elucidation of the matter.

That such thought and observation are called for will be manifest to any one even glancing over the literature of the subject. While one class of writers speak of acclimatization of plants and animals as a matter of course, and of man as being the animal most capable of adaptation, others scout the idea of the human race being,

in any degree whatever, subject to the modifications grouped under that head.

Mr. Alfred Russel Wallace, in the ninth edition of the "Encyclopædia Britannica," has, in his usual interesting and able way, presented the subject as it stands at present, with the arguments *pro* and *con*, but with the result of showing that we are still far from understanding the problems involved.

Mr. Wallace defines acclimatization as "the process of adaptation by which animals and plants are gradually rendered capable of surviving and flourishing in countries remote from their original habitats, or under meteorological conditions different from those which they have been used to endure, and which are at first injurious to them." The definition is important because much of the argument which has been adduced against the possibility of acclimatization will be seen to have no bearing upon the subject when brought to this test.

Many anthropologists and climatologists have denied the existence of acclimatization altogether. Knox even went so far as to assert that the white population in America and elsewhere out of Europe would die out if not replenished by immigration. Probably no one would make such an assertion at the present day; but Parkes, in his "Practical Hygiene," and Turner, in Buck's "Hygiene," deny, in a general way, the possibility of acclimatization in the human race, especially as regards malarial fevers, and they are far from standing alone in their position.

Common experience certainly seems opposed to this view. Nearly every one who has traveled has learned that, in undergoing even slight changes in atmospheric and telluric influences, slight disturbances of the system occur which pass away in a short time. It is a matter of common observation and remark that, while the natives of a region subject to any endemic disease show but slight susceptibility, newcomers fall its easiest victims, and foreigners who have been long resident enjoy comparative immunity.

The fact to which Dr. Westbrook called attention in his paper before this society last year—namely, that recent immigrants, more especially the Irish and their children, are peculiarly liable to consumption—must be a familiar one to all physicians whose practice brings them in contact with that class, and yet our fifty millions of people, probably as healthy and rapidly increasing as any in the world, are the descendants of immigrants, and a large proportion trace their ancestry to the Emerald Isle. After a few generations

they show no special tendency to phthisis, certainly no more than the inhabitants of many of the old countries, including the British Islands.

Wallace, in the paper already referred to, quotes from notes furnished him by Dr. Richard Spruce, who resided many years in South America, to show the perfect acclimatization of the Spanish race in the equatorial regions of that continent. In Guayaquil and Piura, from latitude 2° to 5° south, where the mercury rarely falls below 80°, even at night, for months at a time, the white population is of Spanish descent, and of a high moral standard as regards the relations of the sexes, thus preserving it from admixture with the native races. The women are considered the finest on the Pacific coast; they are tall, handsome, healthy, and prolific; the men are large, stout, strong, and well nourished.

Dr. Spruce's notes also show examples of different portions of the same race of Indians, who have taken up their abodes in regions widely divergent in climatic conditions, and each become thoroughly adapted to its new environment. He says: "The warmth-, yet shade-loving Indian of the Amazon; the Indian of the hot, dry, treeless coasts of Peru and Guayaquil, who exposes his head to the sun with as much zest as an African negro; the Indian of the Andes, for whom no cold seems too great, who goes constantly bare-legged and often bare-headed, through whose rude straw hut the piercing wind of the *paramos* sweeps and chills the white man to the very bones—all these, in the color and texture of the skin, the hair, and other important features, are plainly of one and the same race.

"Now," he goes on to say, "there is a zone of the equatorial Andes, ranging between about 4,000 and 6,000 feet altitude, which is very desirable to cultivate, but where the red man sickens and dies. Indians taken down from the Sierra get ague and dysentery; those from the plains find the temperature chilly, and are stricken down with influenza and pains in the limbs," thus showing that, while each has become acclimated to his peculiar habitat, even a partial change toward the conditions of the other branch of the race proves deleterious and in many cases fatal.

The history of the colonization of Algeria by the French is interesting and to the point. After the conquest, about 1845, continual attempts were made by the French to plant colonies there, and, for a number of years, with very little success. The mortality far exceeded the increase by births. The colonists died off, the fertility of the survivors became reduced, and it was prophesied by physicians

and anthropologists that the attempt would prove a failure. After the first few years, however, the tide turned, the births exceeded the deaths in number, and the census of 1870 showed a large increase in French population, only a small proportion of which could be attributed to immigration.

Instances might be multiplied indefinitely of the adaptation of races to new surroundings, but it seems profitless in view of the fact that is now undisputed that the Aryan and Semitic races, springing from neighboring regions in southwestern Asia, have made for themselves homes and established nations in every quarter of the globe, proving conclusively that acclimatization as a race phenomenon has been co-extensive with the colonization of the greater part of the planet.

It has frequently and strenuously been denied that acclimatization can or does take place with regard to malarial and endemic fevers, and the argument to prove it is that Europeans are rapidly and fatally attacked by these fevers upon taking up their abode in the regions where they prevail. This certainly does not prove that acclimatization is impossible, but only that it is necessary, for by the definition we have seen that acclimatization is a process of gradual adaptation to influences at first injurious. If this susceptibility of new-comers did not exist there would be neither its need nor its possibility.

If we accept the modern views in biology we can not escape the conviction that acclimatization is not only a possibility, but an inevitable consequence of a change of climatic surroundings within certain limitations.

"The broadest and most complete definition of life will be," says Herbert Spencer, "the continuous adjustment of internal relations to external relations." * It is a universal principle with living organisms that within certain limitations they have the power of adaptation to their environment, and, if exposed to unaccustomed surroundings which fall short of producing such commotion as to terminate its life, the organism will, by a gradual process, undergo such functional and structural changes as to better fit it for its new environment. In fact, the biological law of adaptation is but one phase of an even more general law, for, according to Spencer, "it is a corollary from the persistence of force that any deviation effected by a disturbing cause, acting on some other member of a moving equilibrium, must (unless it altogether destroy the mov-

* "Principles of Biology," § 30.

ing equilibrium) be eventually followed by a compensating deviation." *

Nearly all the physical influences surrounding a human being, or any of the higher animals, are those which go to make up what we know as climate. The air he breathes, and in which he is constantly bathed; the temperature to which he is subjected; the moisture of the atmosphere, with its effect upon his cutaneous and respiratory organs; the emanations from the soil; the water he drinks; the food he eats; and the clothing he wears—are all either elements of climate or are determined by it. In fact, the climate to which he is subjected is practically co-extensive with his environment. Acclimatization is, therefore, as regards the human race and the higher animals, practically an equivalent expression with adaptation to environment which Mr. Spencer has shown is the fundamental law of biology.

Admitting, then, that acclimatization is a reality, it is evident that it will present itself in two different aspects—as a phenomenon in the life history of an individual and as affecting the races of mankind. In its ethnic aspect, it has been a concomitant of those great streams of emigration which have from prehistoric times poured out from the source of the Aryan race in the valleys of the Himalayas, ever advancing, carrying all obstacles before them, until they have overrun nearly the whole of Europe, portions of Asia and Africa, besides both Americas and Australia. In a lesser degree it has been illustrated by the career of the Jewish race, which, starting from Palestine, has wandered far and wide upon the earth, making itself homes in strange lands.

As students of climatology, and, as all physicians must be to some extent, of anthropology, this ethnic acclimatization has its interest for us, but, as practitioners, the matter of individual acclimatization is of more vital importance. Let us for a moment consider the new forces brought to bear upon the human organism by a new climate, the effect produced upon the organism, and its reaction.

Climates differ in their temperature, their humidity, the weight and density of the atmosphere, and in the degree of variation of each of these; also in the composition of the atmosphere and its impurities, and closely associated is the nature of the food and water-supply. Of course, in a paper like the present it would be impossible to analyze the effects of changes in each of these climatic elements upon the human organism, even if the physiological data were suffi-

* *Op. cit.*, § 68.

ciently well understood, and a mere suggestion is all that will be attempted.

As a general principle, any decided change in the climatic influences brought to bear upon the body will result in a change in the relative demand for functional activity of the various organs. The increased functional activity of one set will result in increased growth and development, while diminished activity of another set will lead to a corresponding atrophy, and in this manner a considerable amount of adaptation will be accomplished. For instance, suppose a person to go from a temperate to a hot climate. The demand upon the skin for increased work, in keeping down the body temperature, is at first greater than it is able to perform. In some manner the liver is deranged, our imperfect knowledge of the functions of that viscus not enabling us at present to say exactly how, but with the effect of causing hyperæmia and intestinal derangements. Without attempting to go minutely into the physiological changes induced by the increased temperature, certain things are evident. The relative activity of the excretory organs is deranged, greater work is called for upon the part of the skin, less is demanded from the lungs and kidneys. The call upon certain organs for work for which they are not prepared can not but result in its imperfect accomplishment, and consequent derangement of the system. But, upon the same principle that a muscle develops by increased use, or the eye or the hand becomes trained to greater skill by exercise, the organs upon which the greater demand is made must, if the organism survive the change, gradually adapt themselves to the increased activity by increased growth and development. The organs which are partially relieved of their function will undergo a corresponding structural involution, the balance of the system will be restored, and the organism adapted, so far as these disturbing elements go, to its new habitat. Accordingly, we find that in the inhabitants of hot climates the lungs and the kidneys are less developed than among the dwellers in the temperate zone, the skin and the liver more developed. In illustration of the changes wrought in the structure of the body by climatic influences, it has been shown that among the dwellers in high altitudes—for example, the Peruvians at an elevation of from 7,000 to 15,000 feet in the thin, cool atmosphere of those heights—the lungs become greatly hypertrophied and the body short and compact.*

There are many other elements in the series of changes which the

* D'Orbigny, "L'homme américain," i, pp. 96–113. Waitz, "Anthropology," p. 37. Walshe on "Diseases of the Lungs," 4th ed., p. 337.

body undergoes. The physiological action of heat upon the sympathetic and cerebro-spinal system of nerve-centers is first that of stimulation, followed by a secondary sedative action, which leads to diminished functional activity of the various organs considered collectively, and consequently the heat production of the body is diminished, as it should be in the course of adaptation to a tropical climate. Probably the effect produced by the climatic influences upon the nervous system has a large share in the adaptive changes. The food demanded by the tissues is of a less stimulating and less heat-producing character, less meat and fat, more fruits and vegetables. This change in an Englishman, for instance, accustomed to his roast beef and mutton-chops, will call for a training of the appetite and of the digestive and assimilative organs, and approximation to those of the herbivorous and fruit-eating animals. Much of the intestinal disturbance consequent upon residence or sojourn in hot climates is probably due to the need of adaptation in this respect. More or less change in other habits of the individual would become necessary, and would be made when experience had taught him its need.

Until the science of physiology is more fully understood, and the function of every organ and the histological changes going on therein are made a matter of more nearly exact demonstration, and the action and reaction of each organ upon every other clearly seen, we can not expect to ascertain the precise manner in which the innumerable influences which go to make up climate do their work. For the present, we must be satisfied if we can discern in them a harmony with general principles.

Turning again to the subject of race acclimatization, we find another factor of prime importance at work—namely, the principle of natural selection. By the dying off of the individuals whose vital energy is insufficient to endure the changed conditions of life, and the survival of those who have become best adapted to the change, the race would be propagated only by those individuals who, either by an accidental correspondence with the new conditions or by a process of adaptive changes, have come into harmony with them, and the progeny, inheriting the peculiarities of their parents, would continue down the generations, as race characteristics, the modifications of structure and function which render them suitable to their new habitat. That this process of race acclimatization does occur is shown by the rapid increase of the negro race in the Southern States, and by the fact that members of that race taken from temperate climates back to the tropical regions whence their ancestors

came sicken and die of the same disorders as the whites who go there.*

One phenomenon has been often cited against the doctrine of acclimatization of races which, rightly considered, will be seen to be one of its most important factors. It is the fact that children of emigrants from any region to one widely differing from their own in climatic conditions are frequently deficient in vigor, especially as regards the function of reproduction, the women being sterile in many instances, and the race consequently nearly or quite dying out in the course of a few generations.

To a certain extent the power of procreation may be considered as an excess of vital power over and above that required to maintain the life of the individual; consequently, when the vital power becomes reduced by struggles with adverse surroundings, the reproductive function is the first to suffer, and, of course, if the change in climatic conditions is sufficient to extinguish it, the race will of necessity die out; but this only shows the limitation of the power of adaptation, not its non-existence; for, if the reproductive function be not extinguished but only limited, this very limitation will aid the process of natural selection by allowing the race to be propagated only from those individuals whose power to resist the injurious effects of the changed conditions has been greatest, and thus gradually bringing the race up to their standard.

Natural selection, then, has been an important factor in the changes produced in a race by change of climate. Is it not possible to regard it as taking a part even in the modifications of the individual organism? It is sometimes difficult to determine exactly what constitutes an individual. Of course it is easy enough to tell the difference between one man and two, but in some of the lower forms of life it is often a question whether an organism should be considered as an individual or as a community of individuals. Now, the body of man or any of the higher animals may be considered as a highly organized community, composed of distinct masses of protoplasm or cells generated one from another, each of which is in a sense an individual living being, and each of which assimilates, excretes, reproduces, performs its function in the animal economy, and dies. The growth and multiplication and functional activity of these cells are dependent upon the play of molecular forces in the cells—that is to say, upon the entrance and exit of nutritive fluids into and from their interior, and the changes effected by the cells in

* Martin on "Tropical Climates."

such fluids and in their own walls.* If, therefore, we conceive of these forces being affected by the environment, as it would seem they must, it will be obvious that the law of natural selection has its part in the modifications wrought in the various organs of the body. For, if the cells going to the formation of any given organ or part of an organ differ in any degree among themselves, no matter how slight that difference may be, some of them must be better suited to the new conditions of life than others. From these, therefore, cell generation would be carried on to a greater extent than from the others, and the organs which they constitute, and the organism itself, would be correspondingly modified.

A change from a cool or temperate climate to a warmer one has been considered; other changes would operate in a similar manner. The converse, removal from a warm to a cool climate, would result in converse changes. Differences in humidity, acting upon the skin and respiratory organs in a somewhat similar way, would effect corresponding changes, and climates of wide and sudden fluctuations in regard to temperature or moisture, or both, would demand still further modifications of the organism, which would be brought about by the operation of the same laws which we have been considering.

The question of acclimatization to malarial influences is an exceedingly interesting one, but one which involves problems beyond our present power to solve. Admitting immunity from endemic malarial diseases, partial or complete, to follow long residence on the part of either an individual or a race in a region subject to their influence, we can scarcely do more than call attention to analogies between this phenomenon and certain other immunities from the injurious effects of noxious influences acquired by custom. Such is the toleration established for certain poisons—for instance, opium, arsenic, and tobacco—in those accustomed to their use. Of apparently like nature is the immunity from variola afforded by vaccination, and from various zymotic diseases by a prior attack. These are problems still awaiting solution; but, whether it shall be proved that these influences have added something to the protoplasm of the cells, or taken something from it, or produced changes in it by catalysis, or whether the changes shall be found to be in the constituents of the blood, all of which theories have been advanced to account for the phenomena, the phenomena themselves must of necessity be found to result in some manner from the changes in arrangement and

* Carpenter's "Physiology," 8th ed., p. 437.

composition of living matter, brought about by the new conditions to which they are exposed.

Enough has been said to show that the problem is a complicated one, but one which lies properly within the scope of physiological science. Its mastery will involve the solution of many of the most profound questions of biology—the actions of heat and cold, of dryness and moisture, upon the functions of the skin and lungs, the digestive and blood-making organs and the circulation, the kidneys, the glandular system, the cerebro-spinal and sympathetic nerve-centers, upon the action of the vaso-motor and trophic nerves, and the mechanism governing the production of animal heat, together with the reactions of the changed conditions of each of these upon the functions and structure of the organism. The influences of changes in the atmospheric pressure and consequent density upon the respiratory organs and the body in general must be considered, as well as the effect of sudden or gradual fluctuations in each of the climatic elements. The effects wrought upon the organism by the presence of diseased germs, the influence of changes in food and water, in clothing and habits of life, must all be considered.

It is evident, and becoming more fully recognized every day, that in the manifold conditions grouped under the term climate we have at our command, not one, but a host of hygienic and therapeutic agents, capable of exerting upon the human body influences potent for good if rightly used, but, like all other therapeutic agents, powerful for harm when used improperly. Hence it must be evident that any progress made in this branch of climatology will be of inestimable value, not only in the treatment of disease, but in the determination of the forces which are to go to the improvement and development of the human race.

Discussion.

Dr. Shattuck thought the paper was extremely interesting, and suggested some points for discussion. Regarding acclimatization of the negro in the Southern States, he was reminded of what had been said by Dr. Miller in conversation last year. Dr. Miller said that consumption, which was formerly almost unknown among the negroes while they were slaves, had, at least in large districts of the South, become extremely prevalent, and was increasing in frequency and fatality. Of course the climate remained essentially the same. The explanation seemed to be that under slavery the negroes were all well cared for, their masters employed good physicians, and it was to their interest to look after the health of their slaves, and to provide them with enough to eat, sufficient clothes, and

suitable dwellings. In other words, the negroes were entirely removed from the operation of the law of the struggle for existence and the survival of the fittest. At present their welfare was nobody's interest but their own, practically; there was nobody to look after them, and they were subject to the law before named. This seemed to be a sufficient explanation of the spread of consumption among this class of the Southern population. The speaker could not understand how any one could deny that there was such a thing as acclimatization. If one would simply take a walk in England and then in one of the New England cities he would no longer have any question about it. The New England population was originally of perfectly pure English blood, and the contrast in the appearance of the inhabitants of the two countries at present was certainly great. Something had brought about the change.

Dr. Westbrook wished to ask a question regarding the negro race of this country. He had understood the author of the paper to say it was increasing. He had recently seen some statistics going to show that it was not increasing. The mortality among the negroes in various parts of the States was very great, and the writer in question thought there was a tendency for the race to die out. Probably the reason was to be found in what Dr. Platt had stated concerning the negro's present and former condition.

Dr. Platt said he had not made a study of the increase of the negro race in this country, but the census showed a very great increase from 1870 to 1880. He had noticed recently in one of our magazines an article intended to quiet apprehension created by some alarmists that the whole nation was in danger of becoming Africanized by the rapid increase in the negro race, and the author showed that the great increase was only apparent, from the fact that the census of 1880 was much more complete than previous ones.

Second Day—Afternoon Session.

Business Meeting, 2 p. m.

President Loomis in the Chair.

The President announced the death of Dr. Elsberg since our last annual meeting.

Several amendments were offered by Dr. Bosworth for the Council, which, being adopted, gave us the amended constitution which will accompany the volume of Transactions.

The resignations of membership of Dr. McSherry, of Baltimore, and Dr. A. L. Mason, of Boston, were read, and, on motion, accepted.

Several new members were proposed and elected, and, as some desirable candidates had not been conferred with prior to presenting their names, they were elected, and, on condition of their acceptance, the Sec-

retary was authorized to add their names to the list of members. All such will be found in the list of members at the close of the volume.

The Committee on Nominations proposed the following ticket, which was elected, as the officers for the ensuing year:

President.—Prof. William Pepper, Philadelphia.

First Vice-President.—Dr. Frank Donaldson, Baltimore.

Second Vice-President.—Dr. Beverley Robinson, New York.

Secretary and Treasurer.—Dr. J. B. Walker, Philadelphia.

Council.—Dr. J. C. Wilson, Philadelphia; Dr. E. D. Hudson, New York; Dr. E. T. Bruen, Philadelphia; Dr. J. H. Tyndale, New York; Dr. F. H. Bosworth, New York.

On motion of Dr. Bosworth, the Transactions were authorized to be printed by the "New York Medical Journal" for this year.

On motion, it was decided to advise the Council to hold, if possible, the next meeting in Philadelphia early in May.

Then adjourned.

J. B. Walker, *Secretary.*

Public Meeting, 3 P. M.

Paper.

REMARKS UPON THE CLIMATE OF FLORIDA.

By J. C. WILSON, M. D.

"*Si la curabilité de la phthisie n'existait pas, il faudrait l'inventer, ne fût-ce que pour consoler le malade et pour justifier le médecin.*"—G. Sée.

WHATEVER may be the ultimate outcome of the systematic investigation of the effects of different climates upon chronic lung diseases now being carried on, whatever the mutations of opinion, whatever the changes of fashion, Florida is to-day, and is long likely to be, the *most popular* of American winter resorts.

The popularity of this region as a resort for invalids, and especially for those suffering from diseases of the lungs, had its beginnings with the medical profession, and is based upon well established and easily verified facts relating to the equability of the climate and the low death-rate from consumption among the residents of the State. Its popularity with valetudinarians and the non-invalid classes, while also largely dependent upon the peculiarities of its fortunate winter climate, is enhanced by the practicability of continuous out-door life, the facilities for fishing and hunting, the subtropical vegetation of many regions in strong contrast with the snow-bound landscape of the North, and the ease and speed with

which it can be reached. To these attractions add the excitement which attends the opening up of new territory, the development of new industries, opportunities for investment, chances for speculation, a most fertile soil upon which may be grown the widest range of fruits, vegetables, and staples, that *ignis fatuus* of northern capital, the orange, and it is easy to comprehend the enormous and increasing annual afflux of northern people to Florida at the beginning of winter. It is also easy to understand why a percentage of such visitors, both of the invalid and the non-invalid classes, and by no means inconsiderable, become permanent residents.

But the popularity of Florida has not grown in the profession as among the people. Medical men, anxious for the best results and seeking to act without prejudice, have in recent years become cautious as to whom they shall send to winter in Florida; have often acquiesced in such a plan rather than ordered it, and this not infrequently with serious misgivings. In the absence of statistical evidence bearing upon the effects of the climate upon invalids of all kinds—evidence difficult to obtain in regard to climate-treatment under the most favorable circumstances, quite impossible upon any adequate scale in this instance—it is not easy to explain at first sight the present guarded attitude of the profession.

But a closer examination of the conditions reveals some warrant for it. In many instances it has grown out of repeated unsatisfactory and disappointing results in particular cases. In others there has arisen a feeling of uneasiness as to the sanitary arrangements in over-crowded, restricted localities wholly lacking natural facilities for drainage. Again, the advantages of other and diametrically different climates have been urged upon the profession with an ability and pertinacity which have carried conviction sometimes even in the absence of proof.

Germain Sée, in his recent work upon "Bacillary Phthisis," divides the climates appropriate to the treatment of consumption into three categories:

1. Warm maritime climates,
2. High-altitude climates, necessarily cold,
3. Warm low climates not maritime,

and regards the first two of these as embodying all that is essential in the climate-treatment of this disease—namely, purity of the atmosphere, the more or less complete absence of dust and microbes in the air, abundant light, and ozone. From the standpoint of this observer, the fact that the low barometric pressure of high altitudes

and the increased pressure of the sea-coast, acting so differently as they do upon the function of respiration, are alike favorable, is only an apparent contradiction. On the one hand, the increased oxygen of low levels is unfavorable to the biological necessities of the bacillus; on the other hand, the rarefied atmosphere freely ventilates the lungs and interferes with the multiplication of this microbe.

I confess to an inability to view the subject in this simple manner. To me phthisis, alike clinically and pathologically, is a complex malady, and climate an entity, the sum of many factors, variations in any one of which may modify the result, and therefore too complex for any save the most cautious generalizations.

The meteorological phenomena of various regions are constantly marshaled before our attention as all-important in determining the nature of the climate, and a subordinate value is often assigned to such matters as soil, drainage, aspect, and exposure to or shelter from particular winds. But the investigation of the climate of different localities from the standpoint of the therapeutist demands that every element entering into its composition (and their number is many) should receive due consideration. In fact, local conditions are so important that wide variations of climate within narrow geographical limits are constantly encountered—I was about to say are the rule rather than the exception. This statement is certainly true of the Florida peninsula. The regions of the State now readily accessible to travelers of every kind, including all invalids who have anything to expect from climate-treatment, comprise four distinct strips of territory, which differ from each other in their climate in essential particulars. I speak now of the peninsula of Florida, and exclude from consideration the main-land contiguous with Georgia and Alabama, which has not up to the present time, to any great extent, attracted the attention of invalids.

These four strips of territory extend in a general north and south direction, and are nearly parallel to each other and to the long axis of the peninsula. They are:

1. The Atlantic seaboard,
2. The St. John's River,
3. The elevated pine lands forming the water-shed of the State, and
4. The Gulf coast.

A brief study of the general characteristics and the special peculiarities of these regions may serve to point out some of the sources of disappointment in the past, the real advantages for a wider range

of patients and their better distribution at present, and the opportunities for a more scientific and more extensive employment of the resources of the State in the climate-treatment of disease in the future.

The two great characteristics of the climate of all these regions alike, in fact of that of the whole peninsula, are mildness and equability. These traits are due to causes for the most part well understood, namely, the sub-tropical geographical position of the peninsula and its situation between the waters of the Gulf Stream on the one hand and the Gulf itself on the other; and its surface configuration, marked by low levels, the average altitude being about sixty feet, and the absence of abrupt elevations or mountains of any kind.

The peculiarities of the different regions depend upon conditions which are purely local.

It is obvious that the greater portion of the territory already accessible to railroad travel, including the fertile "hummock lands," the savannas, and many other regions adapted to agriculture, are unsuited to the needs of invalids, and that a few localities only are adapted to the requirements of health resorts.

1. The Atlantic Seaboard.—The principal stations are Fernandina and St. Augustine. They enjoy the advantages and suffer from the disadvantages of a climate essentially maritime. The life is agreeable, the amusements are diversified; many patients steadily improve at these places. On the other hand, a small number suffer from the abrupt alternations of the land- and sea-breezes, and from a certain sense of excitement or nervous tension which they attribute to the "*stimulating*" effect of the sea-air. This class includes many neuralgic and neurasthenic subjects, those who have a disposition to bleed, and those who have fever. Moreover, these stations are subject to the northeast storms which occasionally prevail here as elsewhere on the Atlantic coast, and are the cold, wet storms of Florida. Sidney Lanier quaintly remarks that the climate of Florida is nearly perfect, but that it has a *northeast nick* in it.

Farther south upon the seaboard the beautiful Indian River country, sheltered as it is by Merritt's Island, is as yet inconvenient of access, and lacking in suitable accommodations for invalids.

For those who are equal to the requirements of an out-door life and fond of "roughing it," this region has special attractions.

A lad of eighteen, the last of a phthisical race, went down there last autumn because he had orange interests to look after, and brought back this spring eighteen pounds of hard additional flesh

and more than strength in proportion. His complaint was that he was "hungry for milk"—a hunger complained of everywhere in Florida.

2. The St. John's River.—I speak of this beautiful stream or chain of lakes with its thirty-eight stations between Jacksonville and Enterprise, a distance of one hundred and forty-six miles, with hesitation, lest in expressing a personal view, which I believe to be well founded, I may do any interest a wrong.

These stations are every winter crowded with the sick and their friends. Lured by its marvelously beautiful scenery, its facilities for out-door life, its clear and almost currentless waters, its gentle air, the consumptive spends his winter along this river in tranquil dreams of better health and strength in the spring. It is an ideal land, and its atmosphere is drowsy with the perfume of its flowers. But what of its climate? Neither the advantages of high, cold stations, nor those of the sea; neither dryness on the one hand nor ozone on the other. It is essentially a sub-tropical lake climate, in many districts a marsh climate. Such a climate as this finds place in no classification of winter or summer stations for the sick. Doubtless there are patients who do well. The open-air life counts for much. It is far better than that of the office or the shop. But some of whom I have knowledge have fared the worse for the seductive climate of the St. John's River. I will not speak of fever except to say that the danger of intermittents constitutes one of the real objections to several of these stations.

Until within a brief time these two strips constituted the accessible regions of Florida for the great majority of invalids and tourists. Some persons could not stand the coast climate; that of the river had dangers for all. Thus the physician set his face against Florida and sent his patients to Colorado, to New Mexico, to California, to Arcachon, to Pau, the Riviera, Capri, the Tyrol, the Engadine, the Cape of Good Hope. Such are the journeys which the rich man with damaged lungs is called upon to make in search of the health he seldom finds. The poor must stay at home. And some have been sent to Aiken, the Georgia Sand Hills, to Thomasville; and on the whole they have done better.

But within a year the railroad system of the State has again pushed its way across to the Gulf and opened up new regions of which the climates, retaining the cardinal traits of mildness and equability—nay, more, excelling in these—possess peculiarities and advantages of their own.

Of these, as we proceed westward, the first region is found in

3. The Elevated Pine Lands of the Water-Shed.—This divide extends from the Okefinokee Swamp in Georgia southward and somewhat to the east, with an average altitude of about two hundred feet, and occasional ridges reaching an elevation of three hundred feet. Between this main ridge and the Gulf there is a second line of elevation known as the Sand Hills, which attains a height of about one hundred and twenty feet. At many points along the line of the South Florida Railroad these lands are being settled and developed with the activity of a new oil or mining country. Exact meteorological data are not yet collected, but the climate of these pine lands is in many respects not unlike that of Aiken or Thomasville, but much milder and more even. The soil is sandy and deep, with good natural drainage facilities; it is adapted to market gardening, and, when properly cultivated, sufficiently productive. The pines branch high and afford little obstacle to the free movements of the atmosphere. The summers are bearable, and many invalids are becoming permanent settlers. It is safe to predict for this region a useful future in the climate-treatment of diseases of the chest.

Finally, 4. The Gulf Coast claims our attention. Here we find the perfection of the warm maritime climate—from Cedar Keys to Punta Rassa, a coast-line much broken, deeply indented, and of rare beauty. This region rejoices in a climate which possesses, in an exceptional degree, the qualities of equability of temperature, purity of atmosphere, and comparative dryness. Stretches of hummock land alternate with sandy reaches of some elevation, and often covered with an open growth of pine. Along the edges extend narrow beaches shelving gradually into the limpid waters of the Gulf; overhead is a summer sky.

The mean temperature for the five winter months, during a period of five years, at the United States Signal Station at Punta Rassa, is shown in the following table:

November	69·4
December	64·6
January	64·8
February	66·1
March	68·8
Mean for five months	66·7

The maximum and minimum temperatures for the same months, in the years 1878–1879, are here set forth:

	Max.	Min.
November	83·7	46·7
December	76·2	42·3
January	79·3	46·7
February	79·1	47·6
March	82.6	49·7
Mean for five months	80·7	46·6

The movement of the air is, as a rule, moderate but continuous—a factor of much importance in climate. The influence of the sea and of the abundantly wooded shores, where grow in plenty the pine, the palm, and the cypress, brings about an atmospheric state at once free from inorganic and organic dust and rich in ozone. In this aseptic air, notwithstanding the warm temperature, putrefaction goes on but slowly, and meats hung out are said to remain free from taint and to undergo a slow desiccation without decomposition. This is doubtless also largely due to the dryness of the atmosphere.

The rain-fall is small. At Punta Rassa, during the five cold months, it is given in inches and hundredths from the statistics of the Signal Service as follows:

November	1·62
December	1·08
January	2·31
February	1·79
March	·83
Mean for five months	1·52

The mean of the maximum and minimum temperatures of the water of the ocean bottom at Punta Rassa, for the five winter months during five years, from 1878 to 1883, is here shown:

November	72·8
December	67·2
January	63·6
February	68·1
March	73·0

The advantages of this region as a winter station have long been known. The Government Reservation of Fort Brooke, at Tampa, was formerly used for this purpose. Some years ago Dr. Levis, of Philadelphia, published an admirable paper describing the climate and life of the Gulf Coast. At the meeting of the American Medical Association this year at New Orleans, Dr. Van Bibber, of Baltimore, again called the attention of the profession to it, with a valuable sug-

gestion as to the hygienic principles to be regarded in the improvement and development of localities designed to be used as health resorts.

The obstacles to its settlement and growth hitherto have been connected with difficulty of access and want of means of communication—a difficulty no longer existing. Railroad and steamboat facilities are to-day ample, and the tide of travel has set toward this region. Towns and settlements are springing up at many points. Large investments of capital have led to an extended knowledge of the advantages and resources of this portion of the State. Suitable accommodations for invalids and tourists are projected in various localities. The establishment of sanitaria and other similar institutions upon a large scale in regions previously unsettled affords opportunities for measures of hygiene elsewhere practically unattainable. Danger of over-crowding and errors of drainage may be at least avoided.

Among many excellent localities, the high strip of pine land which extends as a peninsula between the Gulf and Tampa Bay, terminating in Point Pinellas, has great natural attractions. Its dry, sandy soil, its comparative elevation above the water-line, its protecting reefs and islands, its narrow but smooth beach, its clear waters, abounding in fish, and its natural semi-tropical vegetation, adapt it in a remarkable degree to the purposes of a health resort. The Statistical Reports of the Surgeon-General's Office show that the climate of Fort Brooke, across the bay from Point Pinellas, possesses in a high degree the favorable characteristics of this general region. The thermometric range is "less than at any other point in the United States, with the exception of the coast of southern California." The mean annual temperature is 58° F., with extremes of 92° F. in summer and 34° F. in winter. I have been informed by trustworthy observers that the temperature at Point Pinellas is some degrees higher than this, that the extremes are less, and that frosts are practically unknown. In fact, the Point has been spoken of as the "Frostless Pinellas." Like the rest of Florida, this region enjoys complete immunity from the sudden variations of temperature and violent storms which occur in the vicinity of mountain ranges. The prevailing winds are from the south and west; northeast storms are unknown except at the equinoxes; northwest storms, which correspond to the "northers" of Texas, are occasionally felt. These are the cold, dry storms of Florida. The settlements upon Point Pinellas at Big Bayou are exempt from every form of malarial

disease. The water in the bay is always warm, the beaches are of gradual slope, the ebb and flow of the tide only about twenty inches; bathing is therefore practicable at all seasons and free from danger.

In conclusion, it may be affirmed that the climate of Florida, though possessing the attributes of warm maritime climates in general, is much diversified and is, in its various regions, adapted to the requirements of a large class of invalids both for the winter season and as a permanent residence.

Discussion.

Dr. Tyndale said the use of the terms mildness and purity, and others, in Dr. Wilson's paper gave him occasion to say what he might have said in connection with Dr. Denison's paper. Such terms were negative expressions, and were implied in the positive ones used in Dr. Denison's paper. Dryness, equability of temperature, and elevation implied all the other qualities or elements of climate, such as sunshine, wind, and electricity, for the latter were dependent upon the former. The terms mild, soothing, etc., denoted sensations only. He would not compare the effects of dryness and elevation, which were inseparable, with those of equability of temperature, but would say that there were statistics to show the influence of these climatic elements upon the human system, and it was these positive facts which were of value in the study of climatology. Sunshine, an implied quality of these three, was to be found in connection with equability at the sea-shore, and in connection with dryness and elevation at inland altitudes. Sunshine had two qualities, that of abundance and that of intensity. Abundance, there being a great many clear days, was common to the sea-shore and to inland stations, but intensity of sunshine was present only at inland altitudes, where there was no obstruction in the atmosphere to the passage of the rays of light. Of other elements of climate he knew nothing of the effect upon the human body, except as they were negative, interfering with comfort. In this regard wind was the principal factor, having the effect of rapidly cooling the body and creating dust and general discomfort, and was generally an attribute of dryness and elevation rather than of equability and moisture. If we had to choose in any given case from among the three elements of climate mentioned, dryness, elevation, and equability, which included other conditions, such as electricity, ozone, etc., it was better to choose the first and second and leave out the third, for the third without the first could be of little benefit. In other words, it was better to choose dryness in connection with elevation, and forego equability, than to choose equability and forego dryness and the effect of elevation or reduction of pressure. In that respect he would say that he believed the peninsula of Florida had only the element of equability with abundance of sunshine but without intensity.

Paper.

THE CLIMATE OF SOUTH CENTRAL FLORIDA ESPECIALLY FOR THE PULMONARY DISEASES OF WOMEN AND CHILDREN.

By J. M. KEATING, M. D.

I HAVE been requested to come before you with a short paper giving my experience upon one of the most important branches of the practice of medicine, and I regret that time will not permit of a more elaborate statement of the results of my travels in many lands and many climes on various occasions. I have seen enough to know that the study of climatology is one of the most important for the physician, and also—I say it with regret—I have learned that there is possibly no other branch that receives so little attention. How often have I met cases of advanced phthisis, away from all the comforts of home and its surroundings, dying in a strange land, sustained only by hope and the fact that they were carrying out the physician's order! I wish that my words could only be made sufficiently impressive to picture to you, as the subject comes up before me, the many sad cases I have witnessed. It is so very easy for the doctor, who possibly knows that all hope is ended and a fatal termination not very far distant, to say to his patient, "Go to Algiers," "Go to Egypt, Australia, or California." The poor unfortunate patient is at once inspired with hope. His weakened frame is sustained by the nervous energy which is brought about by determination. The long journey before him is no obstacle. Its discomforts are discounted, and yet he scarcely reaches his destination before nature gives way. The journey to a foreign land requires a degree of strength that is often surprising even to a man in good health. The wear and tear, the vicissitudes of temperature, the character of the cooking, damp sheets, and the hard beds, are much more wearing than most of us imagine. Our Consul-General to Egypt some years ago told me that much of the business of the Consulate was the caring for the baggage of the consumptives who had been sent from home in the last stages of the disease, to run down more rapidly, and possibly die within two or three weeks of their arrival. One of the most shocking sights to the invalid traveling South is to run across the boxes with the death certificate upon them waiting at the stations for the Northern train. Although I have the greatest possible belief in the value of the change of air and the residence in

a suitable climate for those in the early stages of disease, or where predisposition exists, or during convalescence, I am strongly opposed to the method at present adopted of recommending places in a general way, regardless of their suitability, and other matters as important as the climate itself. A physician should know thoroughly the place to which he is sending his patient; be as familiar with it as with the drug he orders in his prescription.

I met, in a fog, on a ship in the China Sea, a young lady who had been recommended by her physician to New Zealand. When she reached there with her family her condition was such that they determined to bring her home. They returned by way of China, and the dense fog they encountered increased the catarrhal phthisis, which was rapidly breaking down, until she was in a sorry condition. Had she been sent to Aiken or Thomasville, or possibly Bermuda or Santa Cruz, and surrounded by the comforts of life, in an equable climate, within a few hours of her own home, she certainly would have lived longer. There are several things that are to be taken into consideration before a choice of residence is made. First, the possible prognosis, provided the patient remains where he is, judging from the stage of the disease and the rapidity of its progress, speaking, of course, of pulmonary troubles. Then the temperament of the individual, whether he or she be one of active disposition, ready and willing to take exercise, improved usually by cold, dry weather; or, on the contrary, one of a nervous temperament, or of sedentary tastes, whose improvement will be brought about by taking in the fresh air and with it sunshine and warmth. Also, the financial condition of the patients is a very important matter. Good food and plenty of it are as important a factor as fresh air. Unfortunately, these can only be found in very high-priced hotels, and many patients will be obliged to put up with inferior cooking and poor accommodations. It would be far better for such to remain at home. I would certainly make it a rule that, unless the individual is well enough off to obtain all necessary comforts and some luxuries, he or she had far better stay at home. Then, again, the place must be suited to the individual not only as regards climate, but pursuits. Invalids must be interested. If they have been used to comforts, they should be surrounded by them. In fact, they must be placed in a position to take advantage in every way of everything that will be beneficial. I am speaking more particularly in regard to the pulmonary diseases of women. Patients are often sent South too late in the course of the disease. Those who would otherwise be im-

proved remain away too short a time, and return home entirely too early in the season. We have undoubtedly in this part of the continent, close at hand, a choice of climates to suit every individual and every case—from the higher and more bracing air of the Adirondacks down to southern Georgia, through Florida, to Bermuda, St. Thomas, Santa Cruz, Jamaica, or the delightful Isle of Pines on the southern shore of Cuba, noted not only for its benefit in pulmonary troubles, but its great value, due possibly to the water, in chronic intestinal disorders. To-day I desire to call attention to south Florida—especially to the central southern portion, the backbone of the peninsula; and I feel that by simply outlining its general characteristics and pointing out the places that my own experience enables me to recommend, I will make my remarks more practical. It is scarcely necessary to speak of the value of Aiken, due to its sandy soil and pine forests; or of Thomasville, situated in southern Georgia, a spot where sunshine is the rule, and where patients are surrounded by every comfort, at present, which they could wish for. But, for certain classes of cases, especially in the winter months, Aiken and Thomasville are both much too cold; and it will be necessary for us to seek a spot below the heavy frost-line, which will combine the advantages of an inland climate with the soft, balmy air of the subtropics, and present the characteristics of soil and vegetation which have been found of advantage in phthisical troubles. Passing down through Gainesville, we reach the lower part of northern Florida, and, as we come to the 29th parallel, once more ascend in altitude until in Orange County we reach the highest point above the sea on the peninsula. We have here the sandy soil, the pine forests, and, in addition, a climate which is insular in its softness and steadiness, but where the winds have been deprived of their moisture by being dried by passing over large tracts of land.

Florida is divisible into four parts: two geographical, into north and south Florida; two topographical, into the low land of the rivers and the sea-shore and the high and dry lands of the interior. The northwestern part of Florida—the old part—is so much like southern Georgia in all respects that we will give it no particular attention; the peninsula part is the most interesting in a sanitary point of view. North and south Florida are divided by the 29th parallel of latitude, and the climate of the southern part of the State is widely different from that of the northern. The climate of southern Florida is milder in winter than that of northern Florida, for obvious reasons. In the first place, during the heats of summer the winds generally blow from

the Atlantic to the Gulf, and blow over sufficient land to heat them by radiation. The thermometer rarely reaches 98 degrees in midsummer; breezes blow almost continually, and the nights are cool.

The difference in the winter climate in the two sections is still more marked. During the winter the coldest winds blow from northwest by west, and can reach central Florida only by passing over the Gulf of Mexico. A little distance north of 29 degrees we have but purely land winds; consequently the temperature falls very rapidly in northern Florida and slowly in southern Florida. In December, 1880, occurred the coldest weather known there for fifteen years; on the coldest day the mercury at St. Augustine fell to 16 degrees; at Jacksonville to 20 degrees; at Palatka to 24 degrees; at Orlando, the principal town of south Florida and county-seat of Orange County, the mercury fell no lower than to 30 degrees. The climate of the western coast of Florida is colder than that of the interior; the cold winds seem to precipitate themselves upon the coast, and to grow milder as they proceed eastward. The climate of Tampa is colder than the climate of the same latitude on the Indian River. There is no clearly defined frost-line in Florida, but 29 degrees separates as nearly as possible the regions of damaging frosts from frosts too light to injure orange-, lemon-, or lime-trees. Orange County lies south of 29 degrees, and Orlando is its county-seat, about thirty miles west of the Atlantic coast and about sixty miles east of the Gulf coast. The region about Orlando is most favorably known for its temperature; the country lying to the southwest of it, even in the interior, has colder spells of weather than the country in its vicinity. This county is one of the most progressive in the State, being second only to the county of Duval, in which is situated the city of Jacksonville, in the assessable value of its property. Fifteen years ago it was little more than a cattle range. Seven years ago its population had grown to 6,000. At present the population has reached nearly 18,000. Five years ago the town of Orlando was a hamlet of about 200 people. Now it is a thriving, active town, with a population of over 2,500. It is situated on the backbone of the peninsula, 100 feet above the St. John's River, upon the lake plateau, and from it the water flows toward all points of the compass. The country around it is undulating and often hilly, and entirely unlike the parts of Florida commonly seen by tourists. Nearly the whole lake plateau of Florida is covered with pine-tree forests, and is entirely free from malarial influences except near the marshy borders of a few of its many lakes. The soil of nearly all of

south Florida is either a loamy sand or a sandy loam, and is very absorbent of the heavy rains that fall in the rainy season.

The lakes of the famous lake plateau of Florida are 100 in number, are generally very deep, and always filled with clear, cold water; groves are cultivated and houses built close to their clear-cut margins, and people live there in perfect health. The counties lying to the west of Orange are Sumpter and Hernando; they have rich soil, and are mostly underlaid with limestone. These are two of the richest counties in the State, but, owing to the rich land, they are not as healthy as the high ridge of Orange County. This distinction is widely recognized, for, although a large population is moving into Sumpter and Hernando Counties, the wealthier class of people, who desire health and comfort primarily, nearly all seek their homes in Orange County. In the districts underlaid with limestone the water is not drinkable, but in Orange County, where there is scarcely any limestone, most people depend upon lake water, or water from wells.* To the southwest of Orange is Polk County, one of the finest counties in the State. Its lakes are large and numerous and beautiful, the land good, and the country rapidly settling by immigration from all parts. The healthfulness of this county about equals that of Orange.

The best hotels and boarding-houses in the State have naturally been established along the oldest routes of travel. Until within the last few years there have been few railroads built in Florida, and the St. John's River was the principal and almost only highway; along its banks are the older towns, best hotels, and best facilities for living in comfort. Outside of St. Augustine, the best hotels in the State are now upon the St. John's River. Northern enterprise and capital have recently entered the field there to compete with the

* The importance of pure drinking-water can not be overestimated. Rain-water, collected in tanks that can easily be cleansed, should be the only water used in these resorts; this should be insisted upon until some means of drainage is established in these Southern places. So far as I know, no attempt has been made to drain these villages, and, as the population is increasing enormously, the numerous lakes attracting settlers to their vicinity, the tendency will be to make them receptacles of sewage. It is to be hoped that the great value of sewage as a fertilizer for orange-farms, groves, and truck-farms, will prevent its waste, and consequently the pollution of the water. Many hotels with most attractive surroundings are pest-holes as regards their sanitary arrangements. To seek health and return with typhoid fever is by no means an uncommon occurrence. If physicians would advocate this matter, their patients would be more particular, and hotel-owners would be obliged to secure the advantages of all the improvements given us by sanitary engineers.

river places. At Maitland a hotel was built about six years ago, and was the only hotel in the State upon the high land where reasonable comfort could be found. Within the last three years several hotels have been built at Orlando, and have been poorly kept; at present a large hotel is being built at Orlando, has been already leased to a White Mountain hotel-keeper, and will be conducted next winter as a first-class hotel. Orlando has good livery stables, is located in one of the best orange-growing regions in the center of the lake plateau, and surrounded with many handsomely improved properties; possesses an ice factory, and has all the facilities for comfortable living. The drives about Orlando are numerous, and perhaps the most beautiful in the State. Five miles north of Orlando and two miles from Maitland is the beautiful settlement of Winter Park, and there a large hotel is also building, to be completed the coming winter.* At Altamonte, also on the South Florida Railroad, a few miles from Orlando, is a very good hotel, situated in the pine forests.

The odor of pine in the air is most noticeable; the soil is sandy and absorbs the moisture. The hotel is very well kept, is comfortably furnished, and the climate is as fine as can be desired.

On the northern shore of Lake Monroe, which is at the head of the navigable waters of the St. John's, is an excellent hotel, one of the most comfortable in Florida, surrounded by sunshine, and indeed in every way the most attractive spot for invalids and tourists; I speak of the Brock House at Enterprise.† The prevailing wind in winter is from the northwest, and, on this account, this body of water does not seem to affect the air. The upper shore of Lake Monroe has a mild winter climate; the country around is interesting. But for cases of incipient phthisis, or those with well-marked disease, I would insist upon the pine region.

In the northwestern part of Orange County is a cluster of large lakes known as the Ocklawaha Lakes. There the country is bolder and more rolling, hills often rising to the height of sixty or eighty feet, but the hotel accommodations are as yet but meager.

Several important towns—Eustis, Taveres, Leesburg, and Mount Dora—are situated upon these lakes. At Gainesville and Ocalla, Marion County, and Leesburg, Sumpter County, there are good hotels, all on the line of the railroad whose terminus is at Orlando.

* This hotel, the Seminole, is, I think, now open.

† The hotel is supplied with rain-water for drinking purposes. All excrement is mixed with sand and frequently carted away. All hotels in the South should be obliged to adopt this plan.

Mount Dora has the most beautiful natural location of all the towns in Florida. The hilly character of the interior of south Florida is entirely unknown to the great body of Florida tourists, and most people would be surprised to learn that immediately west of Lake Apopka, a lake upon the summit of Orange County, covering fifty-six square miles, the land rises in several points to the height of five hundred feet above the ocean; these are barren sand-hills, too dry for profitable cultivation, but for south sanitaria can not be excelled. This region is as yet entirely undeveloped.

Within two or three months from this time the places mentioned upon the high land of Orange County will be reached in a few hours directly from Jacksonville, or from the northwest through Gainesville, by rail.*

After an inspection of the interior we will make a few remarks about the lower country along the coast, simply to condemn it as a place for invalids.

The Indian River is but a long, straight estuary of the ocean, with only three narrow inlets connecting it with the ocean; consequently the water is always salt, and the rise and fall of the tide is but a few inches; on the east side it is separated from the ocean by a narrow strip of land too poor for cultivation, but on the west side there is a long, narrow strip of rich land reaching nearly its entire length; at the lower end pineapples, bananas, and cocoanuts are being extensively cultivated; the northern part is the most famous orange-growing region in the world. The most important settlement on the Indian River is Titusville, with two or three second-class hotels; about eight miles farther down is a passably comfortable hotel at Fort Capren; twenty miles south of Titusville a large hotel is now building at Rockledge. The Indian River lies entirely within south Florida, the whole of which throughout the summer months is upon the northern edge of the trade-winds. Attention has been already called to the western part, which is colder, and subject to greater fluctuations of temperature. The summer climate of south Florida is little understood in the North, and is much cooler than is supposed. All the northern summer vegetation can be grown in winter. One peculiarity of south Florida is, that in winter sunshine is almost perpetual; I have been informed by a gentleman, who has spent eight consecutive winters there, that

* Since this paper was read, the railroad has been completed, and the river journey is now avoided.

until last winter, which was exceptional, he had seen, in all that time, but one day in which the sun was not at some time visible. March, April, and May are dry; the rainy season sets in in June and lasts to the end of September. During this period rain falls four or five times per week, the sky suddenly clouding and pouring down a volume of rain and then clearing. These frequent rains tend to keep the summer days cool and pleasant. We may make a few remarks only in relation to invalids suffering from rheumatism, laryngeal or pulmonary troubles. Invalids suffering from these troubles should avoid St. Augustine for several reasons. First, it is on the sea-coast. Secondly, it is subject to sudden violent changes of temperature, occasionally jumping from warm summer weather to frost, falls of 40° in a day not being uncommon. Thirdly, much dust is stirred up by the many carriages in the narrow streets. This dust is coquina-shells ground up under carriage-wheels, and is very irritating. This is the most particular feature in consideration of St. Augustine as a health resort. Unfortunately, it is not sufficiently understood by northern physicians; but, looking at it on the other hand, we certainly have charming weather very many days in the winter. There all is life and gayety, the hotels are fine, amusements many, and the place itself for pleasure only is not equaled by any other place in Florida. Unfortunately, the winter population of St. Augustine is entirely too dense from a sanitary point of view for a Southern city.

Jacksonville does not impress the physician favorably as a health resort; the greater number of invalids sent to Florida are sent to this place and never get below it. It appears to me to be damp, foggy, malarial, and, as far as phthisis is concerned, a place to be avoided on account of dust-storms, which are frequent in winter, and on account of the sudden changes of its temperature.

I can not but conclude this paper by stating that my own experience would warrant me in selecting southern Florida, and that portion of it situated along the South Florida Railroad, as the most suitable place to send our cases of pulmonary disease, especially if they be women and children, owing to the warm, soft, equable climate, which, nevertheless, is by no means depressing, but, on the contrary, is bracing and invites exercise; the sandy character of the soil; the large pine forests, which are certainly of great value; the excellence of the accommodations, and the important fact that the journey is so short and easily made. It is a serious matter to send a lady to California or Colorado whose husband is obliged to attend to

his business in the East; hence the development of Florida is a mere question of time, as such cases will naturally drift there.

Paper.

THE RESULTS OF THE HOME TREATMENT OF PHTHISIS CONTRASTED WITH THOSE OF CHANGED RESIDENCE AND TRAVEL.

By E. DARWIN HUDSON, Jr., M. D.

IN order to make any useful comparison of the results of the home and climatic treatment of phthisis, it is desirable either to compare tabulated statistics, or to submit specific groups of similar phases of phthisis in individuals and families watched through a considerable term of years by a single observer. This observer must combine the rare qualities of an exact diagnostician as regards the cases constituting the test, and of a dispassionate, careful recorder as regards the results—a person free from preconception or bias in favor of any special climate or region. Observers and observations have been numerous, both as to therapeutics and hygiene at home and as to the benefit derived by invalids at various health resorts during their sojourn. But the basis of observations for different collaters of statistics, it must be remembered, differs very widely. Some reside in a country in which phthisis is relatively infrequent, owing to other incidents than climate, as the absence of crowded cities, squalor, and manufactories; whereas in another region the climate may be proved favorable, despite the presence of these vitiating influences. Let us contrast Bermuda and Japan. It is a fact that the residents of Bermuda live to exceptionally old age, and that phthisis, either in family groups, by heredity, or in isolated cases following exposure and inflammatory diseases of the chest, is infrequent. Yet Bermuda is unquestionably too debilitating for any phase of established phthisis or the true tubercular diathesis, being beneficial rather in forms of chronic bronchitis, and notably the dry form. Non-residents, then, are often affected adversely as regards phthisis in Bermuda. Japan (see article, by Dr. John C. Berry, on "Missionary Vacations," etc.) presents a condition quite the reverse. Twenty-four per cent. of all deaths in the native population are by phthisis, while the foreign population, including missionaries, is almost exempt, and cases of phthisis coming to Japan frequently improve or quite recover. The squalor of the natives, and their exposure to ground moisture in their lightly constructed homes

and in the rice-fields, may account for this in a large degree. Yet the two instances fairly illustrate the fact that local observations alone, by local observers, whether as to the home climate or changed residence and travel, when compared, may be full of strange contradictions and unexplained discrepancies. Nearly two sevenths of all the deaths in the world are by phthisis, and the ratio for different localities ranges from total exemption in a few favored places to the maximum mortality. Thus the census map of the United States shows a mortality from phthisis of only 250 in 10,000 deaths by all causes in the territories, southern California, Minnesota, Florida, parts of Georgia, North Carolina, and West Virginia, being only one death by phthisis to 40 from all causes, and reversely as high as 2,000 out of every 10,000 deaths, or 1 in 5, in the greater part of the New England States, a portion of New York, and even of California. Certain States have a wide range in contiguous regions. Thus, in different parts of New York State—the Adirondacks—1 death from phthisis in 20 from all causes, and others as high as 1 in 5. California presents the extreme range of but 1 in 40 in the southern portion to 1 in 5 in the middle and upper sections. But it will be found that density of population, prevalence of in-door occupation, and machine work correspond far more closely with this distribution than do any peculiar features of the regions as to mountain or valley, sea-board or interior, barometric or other meteorological phenomena. True, certain regions, as New England, where all adverse conditions unite—harsh winds, changeable and severe winters, crowded population, manufacturing, and in-door life —present the maximum mortality from this disease.

Lombard states that phthisis is unknown above 5,000 feet in the Alps, and phthisis is unknown in the Andes above 8,000 feet and on the Mexican plateau; but such statistics can have no value or bearing for those who live in the populous portions of the world. The statistics of Henry Bennett as to the south of France show plainly that many patients are there benefited by rest and change. Algiers and Egypt as resorts for consumptives present a most favorable record. So in this country Florida, Carolina, Colorado, Minnesota, all present statistics of undoubted remedial and curative influence for certain cases and certain groups or types of pulmonary disease. Yet, after all, as enunciated by the most recent and perhaps most experienced of the authors on thoracic diseases, there is but one rule in regard to climate for permanent benefit to consumptives—that each individual must ascertain by experiment what climate suits him best,

and there reside for three or four consecutive years.* Rules beyond this, as to humidity or dryness, sea voyage or mountain, have never been formulated except to meet with opposite testimony, and on almost every point there is difference of opinion. Thus, Dr. Alonzo Clark, the venerable professor of practice at the College of Physicians and Surgeons in this city for years in his lectures asserted that if affected with phthisis he would rather be a stage-driver over the Alleghanies, winter and summer, rain or shine, than the son of the most affluent merchant of New York. Yet Dr. Walshe reversely emphasizes the importance of great care in winter, advising housing during the cold and inclement season. As regards the relative value of sea-air, mountain-air, and the terebinthinate air of pine woods, it has been found that ozone is present in the atmosphere of each in excess of other places, and hence the greater purity of air is presumably the essential merit of each place. Further climatic advantages are a dry soil, and absence of sudden changes of temperature, of protracted rain-fall and harsh winds. We must also regard the convenience and comfort which are to surround the patient in his new environment, as well as his companions, in his travel and sojourn, since climate in its widest sense is, as ably defined by Walshe, "the sum-total of the extrinsic physical influence amidst which we breathe." The best statistics as to the relative benefit of the treatment of phthisis at home and at places of resort and by travel are those collated by experienced practitioners and consulting specialists with a wide range of observation—physicians whose phthisical patients at home are numerous, and not less numerous those who travel and reside in every part of the world in their search for health. Laennec, Clarke, Williams, Flint, Loomis, all recognize certain facts as the result of this experience:

1. That change to out-of-door life and occupation greatly diminishes the danger of developing phthisis in those predisposed.

2. That travel and change to regions having comparatively pure air benefit most cases and cure many. Relief from the nerve-tension of business and from home cares, and the greater element of out-of-door life and exercise, are thought to be the chief causes of benefit even in travel and changed residence.

3. Temporary changes from time to time, at critical periods when, by intercurrent colds, pulmonary hyperæmia endangers decline, have restored very many patients partially or wholly, tiding them safely over from season to season past the more dangerous period of

* Loomis, "Practice of Medicine," 1884.

twenty to thirty years of age. In certain cases very slight climatic changes will suffice, for, as remarked by Sparks (Quain's "Dict. of Med.," Climate), "change of climate is only a relative term; it does not necessarily involve removal to a great distance from the patient's home. It includes: 1. Pure air free from dust. 2. Abundance of sunshine. 3. Temperature without extremes or variations. 4. Absence of violent winds, the element of local shelter."

4. The sea voyage, when protracted or repeated, saves very many cases. The data of Williams are especially valuable on this latter point.

Dr. Williams emphasizes the importance that the voyage be long, and, if beneficial, then long and continuously repeated to arrive at a cure. It, therefore, is equivalent to saying of sea voyaging, as has been quoted of land residence, that the individual, having found the climatic change which suits his case, should adhere to it.

Unquestionably the first factor in deciding the selection of a climate is diagnosis of the disease with which we deal. If the view of the unity of phthisis and the essentially tubercular origin and nature of all cases be adhered to, phthisis is then found to exist simply in one of four stages: 1. A pre-tubercular stage—debility, enfeebled chest, cough—in one predisposed by heredity. 2. Incipient phthisis as evidenced by slight areas of consolidation or by tubercular catarrhal process. 3. Softening. 4. Cavities. But I take it for granted that but a minority of the profession hold such a restricted view of the disease. To specify three forms or types of phthisis is more in accord with prevailing opinion and pathological demonstration. The division into (1) true tubercular, (2) catarrhal, (3) fibroid, is generally recognized. The great frequency—perhaps the greater frequency—of the latter two forms, the tendency of the catarrhal to run ultimately into the tubercular, and, finally, the frequent association of the several forms of phthisis in one lung, have materially complicated the diagnosis in many cases, and modified the otherwise simple therapeutic procedure. The family and personal history, the exciting cause and method of development in the individual, his temperature line, expectoration, have to be taken into consideration and associated with the physical signs to reach a comprehensive and rational diagnosis.

If, therefore, I were required to answer categorically as to the specific indications of climate in phthisis, I should do so at once upon a basis of the recognized forms of the disease:

1. In well-pronounced tubercular family tendency the individual

or individuals—usually a growing family of children—should be removed from city to country, from in-door life to out-of-door life, horticultural, agricultural—to cattle-raising, surveying, and other vocations affording occasion to expand the chest and breathe pure air.

2. In chests already invaded by miliary tubercle, nothing is likely to retard the progress of the disease. Better air may enable the system to resist for a longer period, but not permanently.

3. Catarrhal phthisis is most benefited by equable climates—free from sudden change, rain-fall, and winds—by avoiding accession of colds or pulmonary hyperæmia.

4. When caseation of catarrhal products or of interstitial deposits has occurred, the same avoidance of severe climatic changes and sources of hyperæmia is indicated, and dry, stimulating air is preferable.

5. For chronic bronchitis, with attendant peri-bronchitis, bronchiectasis, and catarrhus siccus, moist, balmy air is indicated. Reversely, if secretion is excessive, a drier, more stimulating air, or one loaded with terebinthinates, is indicated.

6. Finally, for simple chronic interstitial or fibroid forms, climate is of little value, except as it acts upon the patient's nervous system and influences mind and digestion.

As regards indications for the tubercular group, we could speak more definitely were we fully aware of the source of infection in this form. If the bacillus be indeed the cause, we need an immediate and specific antisepsis applicable to the air-tracts rather than change of climate. But, if the lymphatic temperament, scrofulous diathesis, and tubercular dyscrasia, are the conditions for its development—if, indeed, tubercle be a development upon vitiated lymphatic structures in the lungs, through the agency of vitiated absorbents arising from foul air, water, food, etc.—then climate would seem to be the remedy.

Yet, thus far, climate and therapeutics alike seem futile to combat this specific phase of phthisis in many families.

Thus, in the Wright family, observed by me during the past four years, no history of phthisical heredity existed. The remote ancestry on both sides, and both grandparents, had been healthy, living to good age. In 1881 the family consisted of father, mother, and five children, all intelligent, industrious, temperate. They all had been exceptionally well, not complaining of even a headache. Their place of residence for ten years previous had been in good sanitary order; but in 1880, by reason of a leaking roof, their side-walls became continually damp and moldy, and a breakage in ventilating- and sewer-

pipes rendered the closets in yard under their windows most unwholesome. The following sequence of deaths occurred:

1. Died, January, 1881, daughter, aged twenty-six; rapid phthisis, cavities, and laryngeal phthisis.

2. April, 1883, father, aged fifty-eight; tubercular marasmus, chronic diarrhœa.

3. December, 1883, daughter, aged twenty-six; phthisis, cavities.

4. December, 1883, mother, aged fifty-eight; phthisis, cavities.

5. December, 1883, son, aged twenty-one; tubercularization at apices, perforation into pleura, pneumothorax and pleuro-pneumonia; death in three days.

6. A daughter, aged twenty-eight (reported in this paper when it was read, in May, 1885, as well), developed acute tuberculosis in September, was admitted into Bellevue Hospital (service of Professor A. A. Smith), and died after a sickness of two months.

One daughter survives, aged thirty-one, suffering with bad cough, and much reduced during winter of 1884–'85, but at present in fair health. The first, third, and fourth cases were sent out of town during the summer and early fall, with slight benefit to appetite and general nutrition, but with no retardation of the advancing pathological changes of the lung. The fifth was removed from his business—brass-finishing—upon the first appearance of temperature and cough, but to no avail.

A second grouping, equally characteristic, I am enabled to submit from the practice of my friend, Dr. W. M. Kemp.

L—— family.—

1871. Died, mother, aged forty-nine; typical phthisis, three stages.

1872. Daughter, aged thirty-two; typical phthisis, three stages.

1873. Daughter, aged twenty-six; typical phthisis, three stages.

1874. Son, aged twenty-three; typical phthisis, three stages.

1876. Son, aged twenty-two; typical phthisis, three stages.

1878. Daughter, aged nineteen; typical phthisis, three stages.

1885. Son, aged thirty-four; typical phthisis, three stages.

The father remained healthy; his wife and all the children died of phthisis within fourteen years. As children, the sons and daughters always looked delicate, except the last son, who looked robust up to 1878, when he left New York, after the decimation of the family, for St. Paul, Minn. He remained there well until 1883, when he lost flesh, began to cough and to decline, and died in 1885. The doctor had often remarked the freedom of the ancestry from his-

tory of phthisis, and the good hygiene of the family's comfortable home.

A lesser group of three children grown to adult age: Mr. I., family with decided tubercular ancestry. One son and one daughter, in 1881–'82, developed indefinite cough and marked deterioration in health. Careful examination of chest in each case, by a distinguished and exact auscultator, revealed no evidence of phthisis. But, despite reassurances, each patient rapidly ran down and died of acute phthisis. The third, a sister, suffering from similar depression and cough, presented auscultatory evidences only of bronchial catarrh, confined to the larger and medium tubes, and a local pleuritis. Yet, warned by the deaths of the other two, she has absented herself each of past three winters, making a trip to the Bahamas and the Gulf States during the winter seasons, returning each spring with restoration of strength and flesh and absence of cough.

The conclusion as to such cases and groups may be restated. We can not hope that climate and travel will determine the course of the disease, but rather exert a general tonic influence which may prove advantageous.

The second group: Catarrhal phthisis must be regarded as the one most amenable to judicious climatic treatment. Since the cases are individual, each the product of recurring bronchial inflammations, either a sequence, as in early childhood, of measles, whooping-cough, or capillary bronchitis, or the result of vitiated air and exposures in adult life, we can not study them in families or groups. But their great number and common occurrence place abundant material for study at the command of any physician.

The transposition of a case of catarrhal phthisis from city to country, from in-door to out-door life, from harsh, changeable climate to even, mild climate, will in most instances benefit and stay the disease, in many work a complete cure. I believe that this is the class also in which we do greatest good by home treatment, securing at home much the same benefits as by travel—viz., rest of body and mind, better air, freedom from exposure, and improved nutrition.

But this class too often defer consulting the physician until the development of consolidation and caseation has become pronounced. They then may be ranked under one head with other cases of caseation which have resulted from unresolved broncho-pneumonia, or local and low-type pneumonia, with unremoved interstitial deposit. I take it that most observers appreciate this distinction as to pneumonia.

While it is quite true that acute lobar or croupous pneumonia, with exudation into the vesicles, almost invariably resolves, and has little relation to phthisis, there are many more cases which from their outset have been atypical, and are especially so in that, long after free expectoration, and the removal of crepitant râles, and after the restored respiratory sound and chest expansion denote the clearing of the vesicles, there remain evidences of interstitial deposit—viz., flatness on percussion and bronchial breathing. I do not refer to the occasional thickening of the pleura which survives a pleuro-pneumonia, but to the interstitial element of the pneumonia. This class of cases tends to early caseation.

When caseation has occurred, and when cheesy masses exist in the lungs, of whatever origin, whether catarrhal or interstitial, they are foreign substances and irritate the lung. They also obstruct adjacent circulation. Hyperæmia of the lung is the result, either direct by irritation, or collateral by obstruction. Persons with caseation are therefore susceptible to slight causes of cold, and contract alike local bronchitis, local pneumonia, and pleurisy from very slight and numerous exciting causes.

Plainly, then, theory will accord with experience that equable climate and pure air devoid of dust or other particles are the chief things needed in these cases. The progress of cases that have reached caseation is, as a rule, thereafter intermittent, or by steps or sudden accessions, each of which is marked by local inflammation. To remove, so far as possible, by climate all exciting causes of colds is the one point in treatment. Whether this is better attained by removal to a selected climate, or by discretion as to exposure in the home climate, or, again, by at once living out of doors and braving the severities of climate, admits of much testimony and discussion.

Mr. W., aged twenty-three, catarrhal phthisis, developing during term of years, lived in open tent in remote portion of Adirondacks through winter of 1880, pursuing rigid directions as to personal cure, and, with approved therapeutics, his case steadily progressed to cavities and fatal termination.

Miss B., aged twenty, delicate from youth, with small chest, gradually developed phthisis; found great benefit with retardation, during summers of 1882 and 1883, at Orange and Montclair, N. J.; later failed, and sought climate of Aiken and Raleigh, with no benefit, and recurring colds, and died in January, 1885.

Mr. M., architect, pronounced, by undoubted authority over thirty years ago, to have consolidation. By travel recovered, enjoying health

and prominent as an athlete for ten years, but ultimately ran into phthisis and died.

Mr. G. W. B., aged thirty-eight, merchant, fifteen years ago pronounced hopelessly ill with advanced phthisis and cavity, yet, by constant care and change of climate and travel, he has rallied and continues in fair health, but with chronic cough, and physical evidences of mixed bronchial, peri-bronchial, and interstitial consolidation.

Mr. S. D., aged seventy-three, publisher, writes that when a young man in college, owing to over-work, he ran down, had a cold and hæmorrhage. He took a trip by sea to Charleston, S. C., traveled for a time, and returned much improved. From time to time he has run down, had colds with variable expectoration, hæmoptysis at intervals of several years, and once pneumonia. Physical examination denotes the bronchial and peri-bronchial origin of his case.

Mrs. E. T., aged fifty, for many years has had weak lungs, with supposed tendency to phthisis. Is very liable to colds, and at times during last ten years has had hæmoptysis, with evidences of catarrhal process in upper lobes, notably the right side in front. In 1883 she developed double pleuro-pneumonia, and, after a critical sickness, recovered. She had formerly wintered at Thomasville and Palatka; but since this sickness, with increased care and removal to a new part of the city, has done quite as well. I regard her case, as shown by physical signs, as one of mixed phthisis—much bronchial and interstitial deposit, with some local changes in pleura. The history as to hæmorrhages, periods of reduced health, loss of flesh, spitting, sweating, etc., warrants the inference that, first or last, cheesy matter must have been present in her lungs.

A notable case was that of R. A. P., in 1878, aged twenty-one, student in the School of Mines. Over-work, cramped position at the assay-table, fumes of reagents, exposures, colds, developed catarrhal phthisis. Local râles at the apices, changed respiratory sounds, raised percussion note, loss of flesh, sweating, hæmoptysis, copious sputa, developed in rapid sequence. The ablest counsel prognosticated a brief and unfavorable course. He was at once put into the field with theodolite, and improved. Return to New York brought back all his symptoms. Finally he removed to Colorado and became robust. Returning again to the city, to his companions, and social privileges, he again became alarmingly depressed. Settling permanently in Colorado, leading the most exposed life, he has enjoyed unbroken good health.

Dr. R. W., from 1864 to 1868 associated with me as medical student and hospital interne. A doubtful family history. In 1869 studied in Germany, ran down, had colds, hæmoptysis. Examined abroad by Walshe, and at home by Clark, Loomis, and Janeway; was pronounced to have second stage of phthisis. Removed to Colorado for one season with some benefit; finally settled down upon a farm in Virginia, and lived some six years quite well. Has had sarcomatous growth removed from abdominal wall, but otherwise is well, and practicing medicine in

one of our river towns, with every degree of exposure incident to a country practice. Never catches cold, or is conscious of any thoracic symptoms. Examination this year showed slight evidences of old trouble in right lung, rather indicative of thickened pleura.

As illustrating the influence of climate and trade upon different persons, I will cite the case of the M. family, residents of New England. In 1876, owing to the delicate condition, and persistent cough of a younger daughter, aged fourteen, she, with two older sisters and two aunts and an uncle—all well—as company, went to Bermuda. A furnished house was taken at Hamilton, and the entire winter and early spring passed there. The patient entirely recovered, and has remained well since. But an older sister, aged twenty-eight, who had not been regarded an invalid, developed an intractable cough on the return voyage, and, owing to unusual fatigue in shopping and further exposures in this city in July, and a journey home to New England, developed pneumonia and died. The left lung was found to be the seat of a large calcific mass, representing some former extensive caseation, which had not been known to the medical adviser, but must have long antedated the season of this trip. Despite the adverse circumstances of her home climate in the Berkshire Hills, this phthisis had come to a standstill; but the enervating air of Bermuda certainly had not added to her power of resistance, since the exposure of the return trip had developed irritation around the old focus, and hyperæmia had terminated in fatal inflammation.

One of the fallacies as regards climate, which must be repeated as tradition rather than from actual observation, is to assert that climate is beneficial only in first and second stages of phthisis, and is of no avail in the stage of cavity.

While I would not send a patient with large and progressing cavity away from comfortable home and friends, among strangers and without means to secure medical aid and kind nursing, yet, under the right circumstances, it is possible in cases of advanced phthisis, with cavity, for indefinite prolongation of life to follow temporary or protracted change, or exceptionally for recovery to ensue. This is especially true if, though cavity be present, the phthisis be circumscribed, limited, as far as physical signs denote, to a portion only of one lung, around the cavity, and there is a coexistent history of its rapid production.

Thus, Professor O., aged thirty, seen with Dr. G. A. Farwell, in 1878–'81, after a very rigid college course in this country and subsequent year of teaching, went to Germany to fit himself for professional duties. Much run down, he visited the south of Europe, and contracted severe cold from exposure in visiting a celebrated ice-grotto. He developed alarming symptoms of phthisis, and was ordered to the south of France,

and, later, he spent a winter in Egypt. Being essentially well, with no cough, but delicate, he returned to this country. Physical examination demonstrated a well-defined cavity, apparently one inch and a half in diameter, at the right apex, and near anterior chest-wall. The rest of the lung and opposite lung were feebly developed, but did not evince disease. The cavity, apparently, was not extending, as it was not surrounded by any area of râles or other evidence of collateral hyperæmia or local catarrhal process.

I have seen in the present year a sailor from Calcutta who had a perfectly cicatrized cavity, fully four inches in diameter, occupying the entire apex of the right lung. When free of secretion, it gave with coins the "Bell" test, clear and musical, as described by Gairdner and Finlayson. His brief sojourn in this country had hastened his phthisis to a fatal result; but the character of the physical signs of the cavity left no doubt of its full cicatrization, and at a remote period, at least one or two seasons before. Sea-faring had probably stayed the progress of his disease. Less favorable cases are too frequent.

G. W. H., aged thirty-five, male nurse, living on dry, sandy land, Jamaica, Long Island, in 1883, had phthisis advanced to pronounced cavity. With every change of climate he contracted cold, and could not regain strength or flesh. As a "last resort" I sent him to Denver, Col., introducing him to the kind care of Dr. Lemen, of that place. The doctor found bacillus tuberculosis in his sputa. Despite treatment and climate, he ran down with greater rapidity than he gave promise of doing at home.

W. H. M., aged forty-five, mining broker, of San Francisco, seen with Dr. W. F. Cushman, gradually developed phthisis advancing to second and third stage, with intercurrent attacks of hæmoptysis, local pneumonia, etc. While he remained in the mountains of Arizona, either living roughly at the mines or camping out with General Crook, breasting the most trying weather, he did well. Each season the temptation to revisit San Francisco and New York, and renew friendships and club life, could not be resisted, and each visit witnessed a recurrence of harassing cough, expectoration, and sweats. Each return to the West rallied him. He died suddenly in Arizona this season, of hæmoptysis.

I may say in advance that I shall give under home treatment brief mention of cases of cavity, but few have done equally well without the benefit of climate.

For the fifth class, chronic bronchitis, little need be said. Experience is likely to guide each patient as to the climate which best suits his case. Equable climate is desirable to avoid accessions of bronchial catarrh and pulmonary hyperæmia. Further than this, cases with profuse secretion demand dry, stimulating air; those with little sputa thrive best in Florida, Havana, Cuba, or Bermuda, where

the balmy air unloads the tumefied mucous lining of the bronchi. We have now to speak of the sixth and last class of phthisical cases —a very large proportion of all—the chronic interstitial or fibroid phthisis, including the very large number resulting from chronic thickening of the pleura and pleuritic adhesions. The one pathological feature of the various cases of fibroid phthisis, whether originating from the pleura, or from the peri-bronchial connective tissue, or primarily interstitial, is the obstruction of the nutrient vessels in vast areas, and resultant areas of collateral hyperæmia. This may result either in progressive hyperplasia in such engorged areas, adding to the existing fibroid, or in more definite inflammatory processes with exudation so copious as to undergo caseation. Fibroid, in this way, may terminate in caseous phthisis and cavities. The same rule as to equable climate applies, therefore, to this class of consumption as to the tubercular and catarrhal forms. But the fibroid forms need more uniformly a stimulating, clear, dry air, of great purity and highly oxygenated, to compensate the destruction of the rete mirabile and contraction and absorption of pulmonary alveoli.

I am of the opinion that this class of patients are to be benefited by slight changes to favorable resorts near home. The nervous temperament, or the nervous condition—perhaps from the frequent association of gouty tendencies in these cases—renders them ill-fitted for the exposures of travel and at uncertain and untried health resorts, and they are especially amenable to quiet life, with regulated habits and good preoccupying society.

For this reason Lakewood, N. J., and similar sheltered inland resorts in the piney districts are especially beneficial to these incurable but slowly progressing cases. The sea-shore is not objectionable for this class of cases during the pleasant season.

Finally, in closing this summary of the climatic treatment and its results, we must emphasize the fact that for each and every form and stage of phthisis much of the benefit derived by travel and changed residence results from the suspension of mental and bodily work, and the substitution of invigorating exercise and out-of-door life.

We are therefore prepared to find, as regards climatic treatment, transition through slight changes of climate to home treatment, with temporary change, or even to hygienic home treatment, and, so to speak, to climatic treatment at home. There are in the two many points in common. Looking over my record of phthisis for the past fifteen years, while I am sure that a majority of those with incipient

phthisis who have changed their occupation and residence, or who have traveled for a long period, have been most benefited, a greater proportion of advanced cases have been obliged to remain at home and have done well at home, under improved hygiene and a climate artificially obtained, aided by medical guidance and good home care and nursing. The records of Hughes Bennett, and of the Brompton Hospital, as well as of the best hospitals of this city, show a marked gain in most cases of phthisis after admission, and so long as they remain under observation.

Indeed, for the poorer class, the transition from their ill-ventilated and cramped homes, with ill-selected food, to a hospital of the better class, with rest, fresh air, and correct diet, is quite as marked a change as is removal from home with extended travel and modified climate for the rich. My impression is that for the same stages of their disease they do very nearly as well.

Parkes says "the effect of climate on the human body composes the sum of the influences which are connected with the solar influences—the soil, air, and water of a place."

Walshe's definition of climate, repeated, is "the sum-total of the intrinsic influences amidst which we breathe." We may, therefore, find a text for our consideration of home treatment in these statements, and say that the first need as regards home treatment is to create a substitute, in improved environment, for travel and changed residence, to control for the best these extrinsic influences which bear upon respiration and nutrition.

The notable results of change of occupation are shown in Flint's last work on "Phthisis"—changes from work as compositor, schoolteacher, joiner, clerk, to farmer, traveling agent, doctor, or other out-of-door life. Recoveries under such changed influences are very numerous. I may recall the instance of A. B., an elderly gas-register in my part of town, who had phthisis in youth and had followed this work many years, and thus prolonged a life likely otherwise to have been long before terminated. Change of occupation from a wearing one to one lighter will often prove efficacious. Notably a change from study in school or college to business and active work may transform the patient. Thus S. F., in 1867, was a student in Cornell University. Had inherited tendency to phthisis. Had cough, weak chest, and failing health. He left college for active business life at his home in Maine, and became robust. A change of abode or apartments will often secure early benefit. A new home with correct sanitary appointments, rather than an old home filled

with pent-up air and odors. Thus, Miss W., aged thirty-two, of the W. family, already mentioned as having six deaths from tuberculosis, lived in a dry room and escaped; those occupying the damp apartments died. A home upon dry, sandy soil is preferable to a rocky foundation and damp sub-cellar. Good through and through ventilation for living and sleeping floors, and an upper floor, rather than basement or ground-floor, are essentials. All sources of sepsis in the home, sewer-gas, rebreathed air, should be sought out and remedied. They poison the lymphatics and render these more liable to specific inflammation. Sources of bronchial irritation—as smoke, dust, escaping illuminating gas—should be removed; carpets and furniture should be freed from dirt, walls washed or wiped down. The submitting of a residence to sulphur fumes exerts a purifying influence upon all the air-spaces in walls and partitions and under floors, such as hardly anything else will. In very old homes the accumulation left between walls by rats and mice, and many other changes in wood and mortar, tend to develop an "old" or musty smell, apparent at night, or whenever the home is long closed. This must be eradicated by more ventilators, new doors and transoms, by windows wherever possible, and by fumigation with sulphur preceding the return after the summer vacation, as mentioned above. The southern rooms should be allotted to the phthisical member of the family. An inclosed piazza, uncurtained upper room, or other improvised solarium, will be of great value for use in inclement weather.

The heating of a home is also of great importance to the consumptive. Stoves and open fire-places are most conducive to freedom from cough. Furnace-air is deficient in oxygen, and often loaded with dust introduced from the street. Where it must be used, I prefer to place sulphate of iron or other odorless antiseptic in the hot-water pan of the furnace. I have found a marked improvement of general health, and relative immunity from colds, to follow this practice.

Next to the housing and occupation of the patient is his method of physical exercise. With very many patients occupation has been abandoned. Daily exercise out of doors is preferable in fair weather —walks, riding in carriage or leisurely on horseback. I do not advocate more violent exercise, as rowing, the "health-lift," ball, tennis, fencing, and boxing.

Many patients, otherwise doing well, induce an hæmoptysis by over-effort, or congest the lungs by vascular excitement. I am very partial to two very simple methods of exercise in-doors. The one

is use of a simple rubber band with handles, which exercises the upper part of the body and expands the chest; the other is an ordinary rubber ball for use at "wall-ball." The latter exercises, in the various postures of bowing and catching, almost every muscle in the body, and can be practiced in any room of ordinary dimensions. The "home exercise" of D. L. Dowd, with the method devised by Dr. Forrest, is of great value. The clothing of the consumptive patient should be such as to guard against changes of cutaneous temperature. I have seen most radical improvement follow the adoption of flannel underwear by those who had never used it—a habit most frequent with ladies, as inquiry will establish. Underwear should be of three grades: thick for winter, medium for spring and fall and chilly evenings of summer, and thin gauze, having part wool, for hot weather. The vicious habit of sleeping in the underclothes, so common with consumptives, should be interdicted. Flannel night-robes or *pajamas* should be substituted, and under-clothes soiled by perspiration should be discarded. The subject of the bath is closely allied to that of the clothing. I have said nothing about clothing with special wraps or of chest protectors, since I think the skin can be so invigorated by correct bathing as to fortify it against all degrees of temperature and most sudden changes. I have long advocated a cold or cool sponge-bath each morning, rendered stimulating by salt, and followed by friction with Turkish towels or flesh-brush. Full baths for consumptives should be as infrequent as consistent with cleanliness. A full hot or warm bath of very brief duration, with the addition of a drachm of liquor ammoniæ or an ounce of crude soda, once a week, to cleanse the skin and open the sebaceous follicles and sudoriferous glands, is desirable, if no tendency to sweats exists; but in the latter case it should be omitted. The diet of the phthisical subject is next in order. It should be fattening, stimulating, easy of assimilation, and should not tax the excretory organs unduly. So long as the patient has a fair appetite, indulgence in a judicious mixed diet should be encouraged. Milk and butter should enter prominently into this. Cream may be taken at meals, or at intervals midway between them. I have found that "half and half"—equal parts of cream and milk—is generally relished better, and persisted in much longer, than cream, which often cloys the stomach. Where an element of indigestion is present, milk in digested forms, as pancreatized milk or kumyss, is most efficacious. Eggs are rarely relished by consumptives. Yet a whipped egg, judiciously sweetened and flavored, will be relished by

the most delicate stomach. So long as steaks and chops are eaten with appetite, there is no need of resorting to raw or scraped meats, cooked in balls, or as "Hamburg steaks"; but the latter, if well salted, are greatly enjoyed and easily digested. Beef-blood from the slaughter-house, or, better, expressed juice of rare-cooked meats, is of the greatest value, and, in a lesser degree, beef-tea and bouillon made from beef extracts. Vegetables and fruits, salads, etc., should never be regarded as a part of the consumptive's diet, but, if permitted, rather as relishes to aid in the maintenance of an appetite. The maintenance of appetite is so essential in phthisis that the consideration of therapeutics begins right here, with the means of creating an appetite when wanting, or of increasing it when deficient. So long as the patient's temperature is normal, and no evidences of tissue-waste or debility are present, it is not best to resort to alcoholic stimulants. A bitter tonic, made without wine or alcohol, will often induce appetite. Such are elixir of calisaya and gentian and decoction of cascarilla. I am in the habit of recommending the "bitter tea" of the late Dr. Tully, viz.:

℞ Sem. carui..... ℥ ss.;
Sem. cardamomi..... ℥ j;
Rad. gentianæ..... ℥ ij;
Cort. aurantii..... ℥ iv. M.

Sig. "Bruise to a coarse powder, place a tablespoonful in a pint of boiling water, and take, cold, a wineglassful before meals."

When debility is manifest, with a tendency to elevation of temperature or sweats, brandy is indicated not only as a heart-tonic and stomachic, but as an astringent. Whisky is objectionable, as too diffusive and favoring sweating. A glass of wine at meals, or stronger potion, in the shape of a punch or egg-nogg, thrice daily, will often speedily counteract existing depression. In order to give the patient the benefit of the best digestion, there must be no sluggishness of the liver, no constipation. It was a favorite idea of Hughes Bennett that indigestion, notably of fatty food, was the beginning of all phthisis. Though this may not be true, it certainly is a most frequent complication, and needs judicious attention.

Bismuth and soda in bitter infusion, before meals, a little pill of rhubarb root, ox-bile, and podophyllin, are simple and efficacious means of meeting most cases of atonic dyspepsia. When more aggravated, milk and lime-water, kumyss, and pancreatized milk must be our chief resources. We are now brought to the point of

positive therapeutics. The treatment of a case of phthisis implies a diagnosis and the selection of remedies measured in a degree by our conception of the future stages through which the case is liable to progress, for a correct estimate of the gravity of existing symptoms and a prognosis as to subsequent symptoms and the ultimate result are most difficult in phthisis.

Whatever theory we may hold as to the nature of phthisis, it will be generally conceded that pulmonary hyperæmia is chiefly to be guarded against, and that elevation of temperature is the most serious and significant symptom of the general debility and the pulmonary changes. I believe, therefore, in antipyretics in incipient and developed phthisis. Even fractional elevation of temperature, if persistent, calls for the conjoined use of cold sponging, mild stimulating, and quinine in full doses twice or thrice daily until it is conquered. Aconite is doubtfully indicated, yet observations recently made indicate that it is efficacious in this disease without depressing or favoring diaphoresis. Antipyrine is especially efficacious for this purpose. The two remedies which are most efficacious in checking tissue-waste do not control temperature with promptitude, as does quinine, but should follow as soon as it has effected its object. These are arsenic and the bichloride of mercury. The effect of each in increasing the quality and number of the red corpuscles has been demonstrated by actual count. Clinical testimony as to the benefits from arsenic is cumulative.

There is good reason to believe that antiseptics, internally administered, exert a control over the temperature of phthisis and over its progress. The glyco-phenic and iodo-phenic preparations have accomplished good results in my hands. This winter I have seen two pulmonary cavities of large size, one induced by lodgment of a foreign body; the second an inter-lobar abscess after pneumonia, a patient of Dr. Boyce; each healed under an inhalation of carbolized steam and carbolic acid internally.

The internal use of nutritive medicines adapted to phthisis engrosses the attention of most patients and of many physicians. Pavy, in his work on "Dietetics," has demonstrated that cod-liver oil is the great nutrient, so far as foods can be estimated chemically with reference to their chemico-vital qualities or nutritive energy. The administration of phosphates chiefly benefits by adding to the general nutrition, and the impression that they may determine calcification of cheesy nodules needs confirmation. I am not in favor of malt extracts; most of them merely derange digestion; but I regard

Hoff's malt efficacious as a malt beverage, just as is porter, Bass's ale, or beer.

The control of night-sweats is most essential. Atropine by the mouth or hypodermically, or ergot given on retiring, will usually effect this. The daily salt sponge-bath will also strengthen the skin and resist sweating. I also advise a "dry salt-towel"—a towel wrung out in salt solution and dried—with which to dry the body at night if sweating is found present. With it the patient may rub himself without fear of chill by exposure; it takes up the moisture, and leaves a dry skin stimulated with salt. The control of cough is desirable. Cough is necessarily present to secure expectoration of accumulated mucus. But beyond this it is exhausting, and an active cause of hyperæmia. A judicious expectorant, combining chiefly chloride of ammonium, camphor, and an anodyne, is best. Counter-irritation is often beneficial. Tincture of iodine, compound iodine ointment, blisters, and dry cups, are efficacious, not only in relieving local pains, but in relieving the underlying process from which the pain results.

I have come to place much value on the special treatment of the air-passages in all cases of phthisis, removing every possible source of irritation. Thus, if the nares are occluded by tumefaction of the mucous lining, it should be reduced by astringent douches and sprays. The painless removal of the mucous membrane with chromic acid, cocaine being used as an anæsthetic, as practiced by Dr. F. H. Bosworth, is most beneficial. The tonsils and uvula, if unduly large, may be reduced surgically. I am especially partial to medicated inhalations for the bronchi. When the bronchial form of phthisis prevails, especially marked by too free secretion, I resort to inhalations of steam loaded with benzoin, or turpentine, or iodine; or, when secretion is deficient, I prefer inhalation of ammonia or compound spirits of ether. So, too, where cavities secrete excessive sputa, or bronchiectasis permits accumulation, carbolic-acid vapor is most useful. It will be hardly necessary to recite cases of the first stage of phthisis benefited by treatment, or even individual instances of apparent cure of the disease.

Hughes Bennett's case of the boy of fourteen with large cavity, radically cured after four years' treatment by cod-liver oil, was much discussed and doubted. It required the confirmatory testimony of Balfour, Sanderson, and Dewar. Yet many have either seen in their own practice similar results, or have examined sound chests in which there were no evidences of cavity which had once been found by

former competent observers. The study of large cavities is most interesting.

J. B., aged forty-eight, for four years has had advanced phthisis with large cavity of left lung. He has, with determination, remained at his position as superintendent of the fire brigade and steam apparatus of one of our largest hotels, and, by moderate work and constant activity and determination, lived till this spring—quite as long as if he had gone from home.

So, G. E., aged eighteen, of English descent, sent to me from Trinity Chapel parish as hopelessly sick. Large cavity at right apex, small at left, emaciated, anæmic, and sweating. Yet, by combination of antipyretics, tonics, stimulants, and hygiene, he was rallied and lived over a year.

Mrs. G., French, was observed by me as having a large cavity for over a year (1883–'85), despite most favorable surroundings. She steadily declined, and died on a journey to New Orleans.

Mr. D. B., aged thirty-seven, with large cavities in both apices, resisted their progress by rigid course of diet, tonics, stimulants, and hygiene for over three years. I have at present at my clinic Miss L. I., aged twenty-eight, a native of the United States. Phthisis of seven years' standing, with cavity under left clavicle of three or more years'. At present her phthisis is in abeyance, and she is in good flesh.

I will cite two cases of signal benefit from inhalation—cases viewed by others as phthisis:

1. A German, brought to my clinic at the Woman's Medical College in 1878, had pronounced bronchial catarrh of long standing, with hæmoptyses, sweats, profuse expectoration, and emaciation. There were no physical signs of consolidation or of cavities. Quinine, inhalation of benzoin, and methodical chest-expansion after the manner of Leaming speedily cured him.

2. Miss L., of Virginia, referred to me in spring of 1885 by Dr. Wylie. She had been regarded by her physicians at home as in the first stages of phthisis, and had been at the White Sulphur Springs and mountains of Virginia, with no benefit. After much care in examination, I determined to my own satisfaction that she had inflammation, limited to the lower end of the trachea and bifurcation of the bronchi—a locality for catarrh, by the by, which is regarded by many as indicative of tubercular inflammation. Persistent inhalations of benzoin and steam gradually unloaded this chronic infiltration of the bronchial mucous membrane, and entirely restored the freedom of respiration with immunity from all local irritation and cough, and her general health was recovered.

Paper.

HAY FEVER, ASTHMA, AND ALLIED AFFECTIONS.

By F. H. BOSWORTH, M. D.

WHETHER hay fever prevailed previous to 1819 is an open question. It is altogether probable, however, that long before this it had existed without being recognized, but it was not until it had attacked a member of the medical profession, in the person of Dr. John Bostock, that it made itself recognized as a distinct disease. Its first appearance in literature was the account given by Dr. Bostock in a paper read before the Medico-Chirurgical Society of London in 1819, in which he described his own case under the name of "A Periodical Affection of the Eyes and Chest." Dr. Bostock continued his observations, and, in 1828, gave an additional account of the disease under the name of "Summer Catarrh."

Dr. Bostock's papers called forth many observations on the same subject, with various theories as to the causation of the disease, which possess only an historical interest. To Dr. Elliotson, I believe, is due the credit of the name of hay fever, which has been attached to the disease since his day, one of his patients, an agricultural laborer, having observed that his attacks were precipitated by inhaling the emanations of dry hay.

The history of the disease it is not necessary to enter upon, all the earlier writers having followed much the same line of investigation, with the addition only that, whereas the disease was originally attributed to the presence in the atmosphere of pollen of hay and grass, it was subsequently found, by clinical observation, that the attacks might be brought on by a very large number of causes, such as dust, smoke, gas, foul air, pollen of corn, of roses, and of various flowers, and fumes of any kind. Subsequently, however, the discussion of the subject seems to have crystallized itself about rag-weed, the poison of which, in this country, was found to be especially active in producing attacks of the disease. This suggestion, I think, was originally made by Dr. Marsh, of New Jersey. But, while often the attacks were easily traceable to the action of pollen of ragweed, it was found that many cases occurred during a time of the year when the ragweed was not in flower, and that, whereas certain cases occurred in the fall, coming on about the 28th of August and lasting until the first frost, others, again, came on in the summer, commenc-

ing about the 10th of June and lasting until August. Again, certain cases commence in May and last through the summer. The explanation of this lies, I think, in the fact that different individuals are susceptible to the action of different irritants, and the attacks only come on when their special enemy exists in the atmosphere. The only difference between these varieties of hay fever, it seems to me, is in the different irritants which give rise to the attack. The clinical history of the cases and the indications for treatment are the same. In what I say, therefore, it is to be understood that the term hay fever is to be used in its conventional sense, as describing a periodical influenza embracing all the varieties referred to.

It has always seemed to me that this discussion of the pollen theory of hay fever has been, to a certain extent, an idle one. There probably has been no fact in clinical medicine more thoroughly established than that the pollen of ragweed will, in certain persons, produce attacks of hay fever, and that these attacks continue, in a more or less aggravated degree, as long as the pollen is found in the atmosphere. The mistake is, I think, in regarding this as an explanation of the disease. It is simply a clinical fact and nothing more, and fails utterly in offering us any rational explanation of the real cause of the disease. So far has this discussion gone, that Blackley has given us a large octavo volume on hay fever, which is a model of painstaking, thorough scientific investigation, and which leaves no doubt as to the truth of the proposition, and yet at the end of all his researches we are no nearer a mastery of the disease than we were before. Still further observation of the pollen theory has shown that in certain regions of the country hay fever is unknown, and that persons who are subject to the disease, by resorting to these regions during the time of their annual attacks, become exempt. This geographical feature of the disease has also received exhaustive treatment at the hands of Dr. Wyman, who in his treatise on "Autumnal Catarrh" has given us an account of the geographical features of the subject which fills a large volume. There is an element of the practical in this in that it enables us to direct our patients intelligently as to where they may expect to find relief from their attacks.

A decided step in advance, I think, was made when Dr. Beard, of New York, breaking away from the old pollen theory as failing to explain the clinical facts of the disease, instituted a new series of investigations, the result of which was to demonstrate that behind the susceptibility to hay fever lay a peculiar nervous condition of the system. Beard's investigations were conducted by sending out

a large number of circulars to all sufferers from hay fever whose addresses he could obtain, propounding a series of questions, mainly with reference to the periods of attacks, causes of attacks, the existence of any nasal disorders, and prominently as to the existence of any nervous habit in the individual or tendency in the family. His investigations seemed to demonstrate almost conclusively that, in a large majority of cases, there was either a family predisposition or a notably nervous tendency in the individual. His conclusions as to this latter point, it seems to me, can not well be questioned. An element of weakness, however, in his line of investigation lies in the fact that an examination was not conducted personally in each case, but that he depended upon answers received from circulars, which necessarily must be somewhat inconclusive, vague, and unreliable. The large number of cases analyzed by Beard, on the other hand, together with the great proportion of cases in which there was shown to be marked neurotic tendencies, lends a weight of argument to his conclusions, which, it seems to me, compels us to accept them.

We have, then, reached this further knowledge of the disease, that certain individuals of nervous habit who inhale the pollen of ragweed, roses, and certain other vegetable spores floating in the atmosphere, suffer from violent attacks of influenza, which continue while this especial pollen remains in the air. We still, however, fail of a full explanation of the disease. Neither the pollen theory nor the nervous theory is sufficient alone or together. The greatest step in advance was made, I think, when Daly, of Pittsburgh, read before the American Laryngological Association in Philadelphia, 1881, a paper on "Hay Asthma and Chronic Naso-pharyngeal Catarrh." Dr. Daly opened his paper by the very pertinent question, "whether we are warranted in believing any case of hay asthma purely a neurosis without first eliminating the possible causation by a local structural or functional disease in the naso-pharynx." After discussing his subject from this point of view, he reports three cases of hay asthma cured, two of which were cases of hypertrophy of the nasal mucous membrane, and one a case of polypus, the cure in each case being obtained by removing the morbid condition in the nasal cavity.

We have here opened an entirely new field of study in this connection, and a hitherto unmentioned element in the production of the disease is brought forward. To Dr. Daly, I think, the full credit should be accorded for thus first calling attention to what I consider

by far the most important element in the causation of an attack of hay fever.

The subsequent and most valuable contributions of Roe, of Rochester, Herzog. Hack, of Freiburg, Mackenzie, of Baltimore, and of Sajous, have all been in the direction of Daly's original observation, and have added much to our knowledge of the disease. Herzog first gave the name of rhinitis vaso-motoria to the disease, and this, I think, more accurately describes it than any other. John Mackenzie, on the other hand, gives, in his latest contribution, the name of rhinitis sympathetica—a term which I can not indorse. In this connection it might be mentioned that Beard, in his circular, gives prominence to the question, "Are you accustomed to have attacks of ordinary catarrh?" To which he received replies: yes, sixty-seven; no, one hundred and twelve; from which he very rationally draws the conclusion: "There is no necessary relation between any nasal or posterior catarrh and hay fever."

In answer to this I will simply say that the question is one which patients are not competent to answer, and which can only be answered by a personal investigation at the hands of one expert in making examinations of the upper air-passages. Of the sixty cases of hay fever which I have personally examined, I have seen none in which there was not notable obstructive lesion in the nasal cavities. The presence of pollen in the atmosphere does not explain an attack of hay fever, because pollen in the atmosphere affects comparatively few people. The existence of a neurotic habit fails to explain it, for thousands of nervous people are exempt from attacks of hay fever, although undoubtedly often exposed to its exciting cause. The existence of a morbid condition in the nasal cavities does not explain an attack, for numberless sufferers from catarrhal disease of the upper air-passages are exempt from attacks of hay fever. The true explanation, I think, lies in a combination of the three causes. Given an individual with marked neurotic tendencies, together with a morbid condition of the nasal cavities resulting in stenosis, and let him be exposed to the pollen of ragweed or any other of the numberless germs and spores which produce the attacks, and we have all the elements necessary for their production, and the probability is that he is a fit subject for the disease and will suffer. It is not, however, all diseases of the nasal cavities which render one susceptible to attacks of hay fever, but, I think, only those whose tendency is to produce turgescence of the blood-vessels, with nasal stenosis. Recent writers on the subject—notably Mackenzie, of Baltimore, Sajous, of

Philadelphia, and Ingals, of Chicago—recognizing the source of the disease as a morbid condition of the nasal mucous membrane, have given it the name of hyperæsthesia, special sensibility, irritability, etc.—general expressions which, it seems to me, fail to give us any definite idea of what the real morbid condition is. They are symptoms rather than structural lesions. Sajous, in his admirable monogram on the subject of hay fever, adopting this theory of the disease, bases his treatment on a plan for changing the nutrition of the membrane by cauterizing the surface, thus overcoming this special irritability or hyperæsthetic condition. This view, it seems to me, fails to recognize the real morbid condition in the nose which leads to its development. There is no established specific condition of the nasal mucous membrane which will produce hay fever, but it is liable to occur in connection with many diseases which we meet with in the nasal cavity, which can be definitely described under recognizable terms, and not under the very general expression of hyperæsthesia or irritability. It is not, however, all diseases of the nasal cavities which render one susceptible to attacks of hay fever, but, I think, only those whose tendency is to produce turgescence of the blood-vessels, with nasal stenosis.

To make my meaning clear, it is necessary to refer somewhat to the anatomy and physiology of the nasal mucous membrane. The mucous lining of the nasal cavities differs in no essential respects from mucous membranes in other portions of the air-passages except in the fact that there lie beneath it, on the turbinated bones, large masses of blood-vessels. The existence of these blood-vessels was well known to anatomists, as shown by John Mackenzie, as far back as the seventeenth century. Prominent attention, however, was called to them by Kohlrausch, and subsequently by Bigelow, who gave them the name of turbinated corpora cavernosa, and demonstrated that they comprise erectile tissue. This unfortunate designation of erectile tissue has been retained in all subsequent writings on the subject, and our ideas as to the true function of these tissues has thus been very seriously hampered in the association of the erectile tissues of the nasal cavities with the other erectile tissues in the body. We are, therefore, led to regard them as bodies whose proper function it is to become erect. I do not recall any very definite observations on the subject of the true function of these cavernous bodies other than the somewhat vague observations of Bigelow, who mentions having seen them swell and subside in animals in much the same way as true erectile tissue in other portions of the body. That

this is the function of the turbinated tissues I do not believe. I have never seen the slightest evidence in man of any physiological swelling or subsidence of these tissues, nor can I conceive any possible physiological function that could be served by such action on their part.

John Mackenzie has gone so far as to trace a certain reflex connection between the erectile tissue of the nose and that of the penis, in having observed that attacks of turgescence and irritability of the nasal mucous membrane follow the act of coitus. That there is any anatomical or physiological relation between the two bodies I think is not demonstrated.

In order to understand what the function of the turbinated bodies really is it is necessary to refer somewhat to the respiratory function of the upper air-chambers. The normal function of the mucous membrane is to secrete mucus, and only in such quantities as are sufficient to keep the membrane in a soft, moist, and pliable condition. Any excess of this amount becomes a morbid secretion. Normally nasal mucus is composed of 93 per cent. of water and 7 per cent. of solid matter. Robbed of a small portion of this water, it becomes thick, inspissated, and unhealthy. Now, as we know, every breath of air that passes through the nasal chambers and reaches the passages below must become surcharged with moisture; otherwise it would rapidly exert a deleterious influence on the mucous membrane of the air-passages beyond in robbing them of their moisture, and so rendering their mucus thick and inspissated. It is estimated by physiologists that in the course of twenty-four hours about five thousand grains of water are taken up by the inspiratory current of air in its passage through the nasal cavities. If, in other words, the humidity of the inspired air be compared with that of the expired air, it will be found that, in addition to the other changes as regards carbonic acid and oxygen, the inspired air will have gained five thousand grains of water. Now, I think I am safe in saying that, if five thousand grains of water were extracted from the mucous membrane of the bronchial tubes and air-cells in the course of twenty-four hours, the result would be complete destruction of their function, to such an abnormally dry condition would they be reduced; for, as we know, in each act of respiration the inspired air reaches only the larger bronchial tubes, and the source of moisture, therefore, of the inspiratory current can not be from the smaller bronchial tubes or air-cells. We are, therefore, forced to the conclusion that this surplus of five thousand grains is taken up by the inspiratory current during its pas-

sage through the nasal chambers, and is still retained by it as it makes its way out through the air-passages, for the only source by which this amount of water could be taken up is the nasal mucous membrane. Certainly from no other mucous membrane of equal area in the body is it possible that such an amount of water could be secreted in twenty-four hours. Now, the mucous membrane of the air-passages is endowed with no especial apparatus for the secretion of water; the only secretory apparatus with which it is endowed is in the mucous glands, which secrete mucus alone.

In the nasal mucous membrane, however, we find an apparatus capable of furnishing this water, and this is the so-called erectile tissue of the turbinated bodies. The necessity for some such apparatus I need not refer to further than to say that it is absolutely necessary and essential, for the integrity of the lower air-passages, that the air which reaches them should be so far charged with moisture that they should not be robbed of any of their secretion. Especially is this true in a variable climate like ours, in which so great changes occur, characterized by excessive humidity or absolute dryness of the atmosphere.

This, then, is the great and prominent function of the nasal chambers, to so prepare the ingoing current of air that it shall exercise no injurious influence on the mucous membrane of the passages below. It has always seemed to me that this great respiratory function of the nasal chambers has been to an extent overlooked in regarding the nose as an olfactory organ, for whereas impairment or loss of the sense of smell is but an inconvenience, and not dangerous to the health, the impairment of the respiratory function of the nasal cavities involves very serious danger. Thus the nose as a respiratory organ becomes infinitely more important to us than as an olfactory organ.

As before stated, the nasal chambers contain no glands which secrete other than mucus. There are no serous glands. The mechanism, however, by which the water is poured out into the nasal chambers, and the ingoing current thus surcharged with moisture, is in this so-called erectile tissue. The watery constituents of the blood transude the mucous membrane, and appear on the tortuous surfaces and passages of the cavity. Now, unless the blood-vessels underlying a membrane called upon for this duty were very large and very numerous, they would be inadequate to supply this large demand. Nature, therefore, has furnished the membrane in this region with such an abundant supply of large tortuous vessels that they assume

the appearance of erectile tissue, and thus have given rise to this erroneous idea as to their function. Were the blood-vessels in this region of the same caliber and capacity as those of other portions of the air-tract, it is easy to understand how the extraction of so great a quantity of water would soon render the current sluggish by its greater consistence, and so completely arrest the function which they were designed to subserve. In addition to this large blood-supply there must be, of course, some delicate mechanism by which this function is regulated. This control is exercised by the vaso-motor system of nerves. So delicately must this be arranged that the transudation of serum must accurately adapt itself to every existing atmospheric condition. To-day, for instance, with air saturated with moisture, the turbinated vessels must be so far kept in control by the vaso-motor nerves that no serum escapes. To-morrow, again, with an almost absolutely dry atmosphere, under the action of the vaso-motor nerves, the blood control is unlocked, as it were; the turbinated vessels are so charged with blood that the current becomes active, and the amount of serum poured out on the mucous surface of the nasal cavity is such as to thoroughly saturate the ingoing current of air with moisture, and still not impair the consistence of the blood flowing through the vessels. This control must be so delicately exercised as to meet not only daily, but even momentary changes in the humidity of the inspired air. It is easy to see, therefore, how great the demand must be upon the vaso-motor nerves which regulate the caliber of these blood-vessels, how constant the watchfulness which controls this exosmotic action, and therefore how easily any impairment of this function might occur.

Coming back to the question of hay fever, I think the best appreciation of it lies in the recognition of the fact that the prominent local symptoms of the exacerbations are caused by disturbance of this great respiratory function of the nasal cavities. And, furthermore, that this impairment is primarily induced by some local morbid conditions in the nasal passages, and that the clinical history of the attack is only completed by the existence of the neurotic habit, and the attack precipitated by its favorite cause, whether it be pollen of ragweed, flowers, or any other irritant.

As before stated, there must be some local condition which produces a turgescence of the blood-vessels with narrowing of the passages, and of these two I am disposed to regard nasal stenosis as by far the most active. The mechanism of this action is easily explained. If from any cause the anterior portion of the nasal cavity

is narrowed (and it is this portion of the cavity which is always narrowed by any turgescence of the blood-vessels, no matter how slightly the turgescence encroaches on the caliber of the passages), it is easy to see how in every act of inspiration the air immediately behind the point of obstruction becomes rarefied. The atmospheric pressure is diminished behind the point of stenosis. This illustrates how the continued action of comparatively trivial causes will eventually lead to notable morbid changes, for, if this action continues for a time, the incoming current of air being checked or obstructed, the air behind the point of obstruction being rarefied, a tendency is rapidly developed in the mucous membrane of the nose to sag down or pouch into the cavity. This puffing out of the membrane is attended with a dilatation of the blood-vessels, especially those of the turbinated tissues.

Let us illustrate this by a case of deflection of the cartilaginous portion of the nasal septum. Cases frequently come under our observation in which an injury of the nose has resulted in an angular deflection near the nostril, producing marked stenosis. The clinical history of the case will almost invariably show that the prominent symptoms resulting from this injury do not set in for five, ten, or even fifteen years later. What has happened has been this: The patient has gone on all this time breathing through a narrowed passage. With each act of inspiration the air behind the point of obstruction is rarefied; the membrane is subjected, therefore, to something of a dry-cupping process which produces a marked relaxation of the vessels. As this process has been going on for years, it has resulted in pouching down or sagging out of the turbinated tissues, together with a certain amount of local inflammation which is produced by the turgescence, and this finally results in permanent impairment of the respiratory functions of the mucous membrane.

Now, if in this case there is a neurotic habit, so-called, we have all the elements favorable for the development of an attack of hay fever when the proper pollen impinges on the membrane. What the actual morbid condition is in what we call neurosis no one has yet told us, but, if clinical facts teach us anything, they would teach that certainly in a very large proportion of cases the special lesion in the neurotic habit lies in a weakness of the vaso-motor control, this weakness showing itself in whatever portion of the body it may select or be drawn to by other causes. If my view of hay fever is correct, we have a special tendency in the nasal mucous membrane

to the development of this lack or weakness of vaso-motor control in the fact that the muscular fibers controlling the caliber of the blood-vessels are already weakened by the dry-cupping process already alluded to. So, in the illustrative case of deflected septum, the essential local condition that has arisen is dilatation of the blood-vessels which compose the turbinated bodies under the influence of diminished atmospheric pressure, a weakening of the muscular fibers which regulate their caliber, and their escape to a certain extent from the control of the vaso-motor nerves.

As regards the part which pollen plays, as before stated, there is no fact in medical science more thoroughly established than that in certain persons the pollen of ragweed, for instance, will produce an attack of hay fever. How this attack is induced is not easy of explanation. On the other hand, how a grain of opium taken into the stomach will produce sleep, or a solution of cocaine applied to a mucous membrane will produce anæsthesia or contraction of the blood-vessels, can not be explained. The fact, however, remains that a four-per-cent. solution of cocaine applied to a mucous membrane will produce rigid contraction in the muscular fibers of its blood-vessels, as we know by observation. So the pollen of ragweed applied to the mucous membrane of the nasal chamber will produce paralysis of the muscular fibers of the blood-vessels in certain individuals who are susceptible to this action and in whom these vessels are already weakened by some local diseased condition of the nasal mucous membrane.

I have not alluded to the symptoms in an attack of hay fever, because they are sufficiently familiar to all. It may be stated, however, that the attacks are believed to consist essentially in a paralysis of the muscular coat of the blood-vessels, resulting in their marked dilatation together with a profuse escape of serum, all the subsequent symptoms being traceable to this primary cause. The vaso-motor control of the blood-vessels being thus unlocked, the watery discharge becoming very great, the whole membrane is thoroughly sodden, as it were; the passages are obstructed; the membrane of the two sides of the nasal cavity being in contact, the terminal filaments of the nerves pressed upon, an intense irritation, pain or itching, with complete occlusion of the nostril, results. Now, this vaso-motor paralysis, which it really is, with a profuse discharge of serum, constitutes a complete unlocking of the whole activity of the respiratory function of the nasal cavity, a letting out of its whole power and potency. This respiratory function of the nose is simply

an exosmosis of serum, but this, taking place in the rapid and profuse way mentioned, constitutes a flooding of the membrane rather than a flooding of the cavity, and therefore causes extreme turgescence of the blood-vessels with complete stenosis of the passage.

Now, an exacerbation of hay fever differs essentially from an ordinary attack of acute rhinitis or cold in the head. Hay fever, from its onset until its termination, is characterized by suffusion of the nose, marked stenosis, and a discharge of serum, whereas an attack of acute rhinitis runs through regular stages of turgescence, with dryness, secondarily profuse watery discharge, and a third stage of muco-purulent discharge, and final resolution. Hay fever commences with a watery discharge, and this continues until the end of the attack, with violent sneezing and other concomitant symptoms.

It has been attempted to divide the generic disease hay fever into two varieties—rose cold and autumnal catarrh—rose cold being that form which, commencing on the 10th of June, ceases on the 1st of July, while the name autumnal catarrh has been given to that form which, commencing on the 29th of August, persists until the occurrence of the first frost. Beard makes a point of having discovered a third variety, what he called the middle form of hay fever or July cold, describing a class of cases in which the attack came on in the middle of July and disappeared on the 1st of August. Any one seeing a large number of cases of hay fever is very soon impressed with the fact that it is exceedingly difficult to form any classification of this sort, and, moreover, any such classification is rather idle, the disease being the same whether occurring early or late in the season, and, besides, the attacks are very apt to become exceedingly irregular. The deduction, however, from this irregularity would seem to be that the agents which are capable of producing an attack of hay fever are almost numberless, and that, while one patient is susceptible to the action of one agent, another is susceptible to the action of a totally different agent, or the same individual may be susceptible to the action of a large number of irritating agents. This is shown by the fact that very many patients have two, or even three, attacks in the course of the year. What the special cause of hay fever is it is difficult to lay down as an absolute law. That the pollen of flowering plants is by far the most frequent and active, I think, can not be questioned. That the most irritating pollen which is found in the atmosphere is that of the ragweed would seem to be proved by the very exhaustive and painstaking experiments of Blackley; but that the pollen of most flowering plants pos-

sesses, to a certain extent, irritating qualities is probable, and hence the pollen of any plant that flowers from the earliest spring till late autumn may be a possible cause of hay fever. Each individual, of course, has his special susceptibility, and while in one it may be the pollen of roses, in another the pollen of July plants, in another it is the pollen of August flowers.

Dr. John Mackenzie, of Baltimore, who has made a most instructive study of this disease, and has written largely on the subject, takes very decided ground against this pollen theory. In his latest contribution he instances the case of a patient who suffered from rose cold, having had her attack brought on by the presence in the room of a rose made of glass. This proves nothing, but simply adds another instance to the long list of curious facts, of which medical literature is full, of the influence of the mind upon the body, as, for instance, when a chill is precipitated or postponed by changing the hour-hand of the clock.

The pollen of flowering plants is not to be regarded as the only ingredient of the atmosphere which may be the irritant giving rise to an attack of hay fever. Among the earliest assigned causes was sunlight, and that the varying conditions of solar heat may be one of the possible causes is probable. Different conditions of humidity may act in certain cases. Many patients with hay fever suffer during damp weather, while I have known other patients to whom a damp day gave infinite relief. Among the causes, therefore, we may recognize, in addition to pollen, dust, smoke, gases, bad air, sunlight, the emanations from various drugs—such as camphor, hartshorn, ether, ipecac, etc., perfumes of various kinds, etc., etc.

Herzog, as before remarked, first gave the name of rhinitis vasomotoria to hay fever. John Mackenzie, of Baltimore, added to Herzog's title of rhinitis vaso-motoria, periodica—a name which describes the disease with a fair degree of accuracy, its periodicity being dependent on the periodicity of the special pollen in the atmosphere which is the source of the attack in each individual.

If, now, we attempt to give a definition of the disease which has been known in literature for the last half century as hay fever, autumnal catarrh, etc., it would be somewhat as follows:

Hay fever is a disease characterized by the annual recurrence at certain nearly fixed periods of the year of attacks of influenza, whose prominent features are: profuse watery discharge from the nose, intense itching, violent sneezing, nasal stenosis, headache, etc., due to the presence in the atmosphere of certain irritating particles, promi-

nent among which is pollen of certain flowering plants, the attack lasting as long as the atmosphere contains these irritating particles, and, when it passes away, leaving the air-passages apparently uninjured by the visitation.

I have heretofore said nothing in regard to hay asthma, so called. This I regard as merely one of the sequelæ or concomitants of ordinary hay fever. In a certain proportion of cases, after the hay fever attack has persisted for a length of time, a new set of symptoms develops, which consists in attacks of what are called spasmodic asthma, coming on generally at night, lasting for some hours, passing away in the early morning, in this respect differing in no essential particular from the disease which has ordinarily been described as spasmodic asthma, with the exception that its development has been preceded by a periodical influenza.

During the past five years a very large number of cases of hay fever, hay asthma, and so-called spasmodic asthma, have come under my observation. A careful study of these cases soon led me to the conclusion that, in the main, hay asthma and nervous asthma, so called, are one and the same disease in all essential features; and in the same way that a structural disease of the nasal cavity gives rise to weakness of the blood-vessels and thereby a liability to attacks of hay fever, and, still further, as an attack of hay fever in a proportion of cases brings on an attack of asthma, just so these structural lesions in the nasal cavity, without the interposition of an exacerbation of hay fever, may lead, in certain individuals of neurotic habit, to the development of what we know as spasmodic asthma. I do not propose to go over the same line of argument here at length that I have already gone over at the commencement of my paper, but I think the same law applies. Given an obstructive lesion in the nasal passages, the pulmonary mucous membrane is subjected to the same influences as the spongy membrane of the nose with each act of inspiration—that is, atmospheric pressure is markedly diminished with every inspiration throughout the whole of the bronchial tract. The result is, as before shown, a tendency to dilatation of the blood-vessels through gradual weakening of the muscular control. The old discussion as to the true nature of asthma need not be renewed. Whether we have to deal with a disease which may be divided into three classes —gastric, cardiac, and bronchial—I pass over as based on insufficient clinical observation.

As early as 1872 Voltolini called attention to the dependence of asthma on the existence of nasal polypus. Still later many obser-

vations were made confirming this view, and cases reported in which asthma had been cured by the removal of a nasal polypus. The general impression, however, I think, has been that these were exceptional cases, and that a case of asthma which can be traced to the existence of nasal growths was simply a fortunate one, as affording definite indications for treatment. My own observations would go to show that the existence of nasal disease is not an exception, but the rule. I think I may go still further and say that during the past four years, in which time my attention has been especially called to this subject, I have seen no single case of spasmodic asthma in which the source of the disease could not be traced to the existence of some disease in the nasal cavity. This is a broad statement, but, I think, one fully justified by my experience.

Before the introduction of cocaine an accurate inspection of the nasal cavity could not be made. Since, however, we have been enabled to thoroughly expel the blood from the turbinated tissues in the nose by the local application of cocaine we have been able to make a thorough and accurate diagnosis in every case which has come under observation. During the past eighteen months I have made many inspections of the nasal chambers in asthma, and treated many cases. In no single instance, I think, have I failed to detect a sufficient cause for the attack, and in few instances have I failed to give marked relief by treatment entirely confined to the nasal passages.

I do not propose to enter upon a full discussion of the clinical history of the disease, but there are certain salient points in connection with it which I think will be made clearer by the following cases which I have selected from my note-book. I pass over many cases of nasal polypus which have been under treatment in which asthma was a prominent symptom, and in which this distressing feature of the disease was entirely relieved by the removal of the polypus. The cases which I report are simply cases which presented obstructive disease of the nasal cavity resulting in spasmodic asthma.

Case I.—Mrs. K., married, aged thirty-seven, has been a great sufferer from asthma since she was twenty-five years of age. In the intervals of her attacks she has had more or less nasal catarrh, so called, yet has never associated the two diseases, but she has noticed that her asthmatic attacks have always been preceded by a mild cold in the head, attended with sneezing and suffusion of the eyes and nose. The attacks generally occur at night; at times they are very severe, and are usually

brought on by a storm or threatened bad weather. She has never received any relief from the various remedies she has tried, and was finally compelled to take up permanent residence in Colorado, where she was entirely free from her asthma, but not from her catarrhal trouble. She left Colorado on October 1st on her way East, and early in November, while in Michigan, her asthma came on, and continued until I saw her on the 18th of November, 1884. An examination of the nasal cavity showed a prominent angular spur projecting into the left passage at the anterior edge of the vomer at its junction with the cartilage of the septum and the perpendicular plate of the ethmoid, producing marked interference with the passage of the air. In the right nasal cavity was a notable thickening of the mucous membrane covering the middle turbinated bone, with that peculiar enlargement which is so frequently met with in connection with deflection of the septum to the opposite side, being apparently an unrolling of the scroll-like folding of the bone.

This case came under my observation a few days after I had first noticed the peculiar action of cocaine on the blood-vessels. I therefore applied for the relief of the attack, which was upon her when she visited me, a two-per-cent. solution freely to both cavities. The result was almost complete relief of the asthma in a very few minutes. This, I believe, was the first case in which cocaine was ever used in asthma, and demonstrated completely its valuable remedial effects in the exacerbation.

The subsequent history of this case consisted in combating her asthmatic symptoms temporarily by the use of cocaine with entire success for the time being, although the applications required renewal three or four times a day, and sometimes oftener. On the 21st of December the right middle turbinated bone was removed with the snare. A large mass, half an inch long and about a quarter of an inch in each diameter, came away. The result of the operation was striking relief, although the serious trouble was in the opposite cavity. This single operation gave so much relief that, with the occasional use of cocaine, the patient remained East during the following twelve months in a state of comparative comfort. In January, 1886, I commenced operating on the left side, removing small pieces at a time with a fine saw, and at the present time each passage is fairly clear, and the patient virtually cured of her asthma.

The interesting points in this case are: the demonstration of the intimate connection between the nasal stenosis and the asthmatic attacks, the successful use of cocaine for the temporary relief of stenosis, and successful resort to surgical measures for the radical cure of the disease.

Case II.—Mr. S., aged forty-three, merchant, called to see me October 14, 1884, with the following history: For fifteen years he has been a sufferer from asthma, the attacks coming on early in May, lasting until the 1st of June, and coming on again in the middle of August, lasting until cold weather. The family history in this case was strikingly neurotic, showing for three generations a large number of cases of hay fever, asthma, and other nervous diseases. In addition to his asthmatic attacks he had each year more or less catarrhal trouble. Examination of his nasal cavity showed very marked hypertrophy of each turbinated bone, the mucous membrane on each side being in contact with the septum, which was slightly deflected to the left. I immediately removed by the snare the left middle turbinated bone, extracting a large mass, with the result of immediate relief from his stenosis. The only untoward symptom in this case was hæmorrhage lasting two days, which was arrested with the greatest possible difficulty. The result of the operation was complete relief from his asthma for that season. Fearing to operate on the right side on account of hæmorrhage, the treatment there was confined to cauterization, which was made at intervals of perhaps a month. I last saw this patient on the 17th of January, this year. The result has been virtually complete relief from both hay fever and asthma.

This case possesses an additional interest in the excessive hæmorrhage from the middle turbinated bone, which would seem to verify my former statement in regard to a vaso-motor paralysis constituting the essential lesion in the nasal cavity which causes both the hay fever and the asthma. With one other exception, in all my experience I have not met with any severe hæmorrhage in operating upon the middle turbinated bone.

Case III.—Frank C., aged seventeen, consulted me November 26, 1883, having been a sufferer from asthma since he was two and a half years of age. The attacks were characterized by dyspnœa, cough, expectoration, etc., coming on at all times of the year and nearly every day, lasting several hours. He was a pale, emaciated, ill-nourished subject, with notable pigeon breast. An examination showed a fracture of the cartilaginous portion of the septum, with a marked angular spur projecting into each nostril, together with very notable hypertrophy of each lower turbinated bone. A mass was removed by the snare from the left lower turbinated bone anteriorly, which brought into view a still larger mass of hypertrophied tissue on the left middle turbinated, which was also removed by the snare at the same sitting. I saw this patient again on the 11th of December, when he reported that he had been entirely free from asthma, although considerable discharge and nasal stenosis still existed. I again removed from both the lower and the middle turbinated bone of the left side small masses of hypertrophied tissue, with the result of markedly clearing the passage of that side. It was a very interesting

observation during this sitting that in using a pledget of cotton to wipe away the secretions of the left side the patient was seized with an attack of asthma, the result of this obstruction to the nasal passage. I removed the cotton, and, after waiting a few minutes, put my finger over the left nostril. *The asthma immediately returned*, disappearing upon the removal of my finger.

On June 30, 1884, I saw the patient again, when he showed marked improvement in general health, had gained in weight, and had had almost entire freedom from asthma until within a few days. I removed still more tissue from the left nostril, and also commenced to operate upon the right. December 6, 1884, the patient was free from asthma, but there was still some obstruction. The spur of the septum was removed by the saw. The subsequent history of this case consisted in visits at my office at intervals of from three to six months, with entire freedom from asthmatic attacks until within a few days of each visit, when I found sufficient structural lesion to account for renewal of the attack. Continuing my operations, I did my last one on the septum of the right side on October 1, 1885, since which time his progress has been entirely satisfactory, gaining in health and strength, and enjoying immunity from his disease. The only points of special interest in this case were the success which attended operative measures in a patient whose case seemed to be an exceedingly unfavorable one on account of his general condition, and the striking illustration of an attack of asthma produced by plugging the nostril, as occurred on his visit at my office December 11, 1883.

Case IV.—Mr. S., aged forty-eight, consulted me first on November 21, 1885, giving the following history: About a year ago he commenced to suffer from asthma, his attacks coming on usually every day for about two hours in the afternoon, and again at night he would be awakened after falling asleep. During cold weather he was usually free from any trouble. This gentleman came to me with a fully developed attack upon him, breathing being very labored and notably cyanotic. As an experiment I applied a four-per-cent. solution of cocaine in each nostril, and, with my ear to his chest and my watch in my hand, I timed accurately the duration of the attack. At the *end of fifty seconds not a râle could be heard* by auscultation, and the relief was complete. An examination of his nasal cavity now showed deflection of the septum to the right, with a spur running from before backward parallel with the floor of the left naris, and at the junction of the vomer with the palatal process of the superior maxillary bone there was also notable hypertrophy of the right lower turbinated bone. I made an application of chromic acid to the lower turbinated bone, and saw him again November 24th, when he reported entire freedom from asthma for two days. The cauterization was repeated on that day and again on the 28th. On the 7th of September the cartilaginous spur in the right naris was removed. On the 28th the projecting portion of the septum was removed. With the exception of

an attack of asthma during a severe storm in January, this patient has been entirely relieved.

Case V.—S. F., aged fifty-four, called to see me January 6, 1885, with a history of catarrhal trouble for many years, with nasal discharge and liability to colds, which of late have developed into a cough. Last winter, and also this winter, his bronchial attack has been attended with oppressed breathing. In addition to that, he also suffers severely from what he has considered nervous headaches. An examination in this case showed a notable deflection of the septum to the right side, with a septal spur at the articulation of the vomer with the superior maxilla. In this case treatment was confined entirely to the use of the saw, removing the irregularity of the septum on each side. His trouble was for a time somewhat aggravated by the copious catarrhal discharge which was set up as the result of each operation. But when finally the septum had been restored to a fairly normal contour, and the passages had been rendered open, his symptoms gradually improved until, with the exception of a mild attack in March, he has not only been relieved from his asthmatic attacks, but notably relieved from the headaches which at times had been so severe as to unfit him for business.

Case VI.—Mr. C., aged forty-seven, merchant, consulted me November 6, 1883, with a history of recurrent attacks of spasmodic asthma for the last fifteen years, recurring without any special periodicity under the influence of changes of the weather, colds, etc. For two years he has been troubled with catarrhal discharge, characterized by an accumulation of mucus in the fauces, with some nasal stenosis. An examination of the nasal cavity showed a moderate amount of hypertrophy of each lower turbinated bone with very marked enlargement of the middle turbinated, and in the vault of the pharynx a large mass of adenoid tissue. I made a number of applications of chromic acid to the turbinated bones, both lower and middle, but without giving entire relief until, in the following spring, I *removed*, by means of a curved snare, the *mass of glands in the vault of the pharynx*, since which time he has been *completely free from his asthmatic attacks*. This case presents considerable interest in the fact that the asthma was dependent upon the obstruction due to the existence of an adenoid in the vault of the pharynx, a growth which I really believe belonged to the food-tract rather than to the air-tract, but adventitiously offering, of course, a certain amount of obstruction to the free entrance of air to the lungs. This patient had no further attacks. I have never seen a case of hay fever dependent upon the existence of an adenoid of the pharynx, nor do I believe such a thing possible. In all cases, I think, the vaso-motor weakness is below the obstruction, and never above it. Therefore an obstruction due to the existence of an adenoid can only result in an attack of asthma, or, as I think we might properly designate the disease, a vaso-motor bronchitis, just as we designate hay fever vaso-motor rhinitis.

I might repeat these cases, but I have reported sufficient to bring out the points which I desire to emphasize, and these are the direct dependence of a large majority of, if not all, cases of asthma upon some obstructive lesion in the nasal cavity. This is evidenced by the immediate relief from the exacerbation by the use of cocaine in the nose in every case in which I have tried it; and, furthermore, the cure of so many cases by the removal of the structural lesion which exists in the upper air-passages. The foregoing cases, it seems to me, illustrate these points fairly well. I have on my records between forty and fifty cases of asthma, the report of which would be only a repetition of the foregoing, but every one, I think I may truly say, substantiating this statement. Further proof of this, I think, is offered in the clinical history of so many cases of asthma which depend on hay fever in that the asthmatic attack never comes on until the nasal symptoms have persisted for some days or even weeks, being apparently precipitated by the persistent nasal stenosis. Furthermore, clinical observations are accumulating which go to show the frequency with which asthma takes the place of hay fever, the nasal symptoms subsiding, and the disease settling down into what we call a chronic spasmodic asthma.

Of the diseases of the nasal cavity which may give rise to asthma may be enumerated nasal polypus, deflected septum, deformity of the septum as a result of fracture, exostosis, ecchondrosis, hypertrophic rhinitis, displacement of the columnar cartilage, or, indeed, any disease which obstructs the free entrance of air to the nasal chambers. Of these causes, by far the most frequent is deformity of the nasal septum, my notes showing that, with the exception of nasal polypus, such a deformity is responsible for over ninety per cent. of the cases.

The prognosis of asthma, I think, needs to be entirely rewritten. Heretofore it has been regarded as one of the obstinate diseases, or, to an extent, one of the incurable diseases. From the point of view of internal medication, certainly our success in its treatment has not been flattering. From the point of view which regards it as dependent upon nasal disease, the prognosis, it seems to me, becomes very much more favorable. Certainly my own experience in its treatment would go to show that it is a disease in which, in the majority of cases, we are safe in offering a favorable prognosis. That all cases are curable I do not think can be said. That most cases are curable I believe is a safe assertion, for, with our present methods of diagnosis and treatment, I believe we have got to that stage where we

can call that disease formerly known as nasal catarrh, and which embraced all diseases of the nasal cavity, a curable disease; and just as far as we can cure nasal diseases, just so far can we cure asthma. Of course, I do not wish it to be said that the nasal lesion is the only indication for treatment, but it is a prominent one. Those general hygienic measures, and perhaps internal medication, by which we overcome what we call the neurotic habit, are by no means to be neglected; but this part of the subject I do not propose to enter upon.

The main object of my paper has been to bring forward the influence of diminished atmospheric pressure, due to nasal stenosis, upon the mucous membrane of the air-passages beyond the point of obstruction as leading to dilatation of the blood-vessels and weakness of vaso-motor control, thus giving rise to attacks of "hay fever" in the nasal chambers and spasmodic asthma in the bronchial tubes. This action of diminished air-pressure has been alluded to by Dr. A. H. Smith ("Medical Record," August 6, 1881) as a cause of hyperæmia and supersecretion. If the points I have endeavored to establish have been made clear, it will be understood that I do not regard supersecretion of mucus as the result of this diminished air-pressure, but rather as a serous exosmosis from a weakening of vaso-motor control.

Paper.

AN HISTORICAL SKETCH OF THE STETHOSCOPE.

By D. M. CAMMANN, M.D.

Mr. President and Gentlemen: I will not consider whether the idea of the stethoscope originated with Hippocrates, Bayle, Hook, or Laennec. Laennec made the idea practically useful. His first instrument was a cylinder of paper compactly rolled and kept in shape by paste. The longitudinal aperture, always left in the center of the paper thus rolled, led accidentally, in his hands, to its discovery. The stethoscope that he subsequently adopted was a cylinder of wood, an inch and a half in diameter and a foot long, perforated longitudinally by a bore three lines wide and hollowed out into a funnel shape at one end to the depth of an inch and a half.

Piorry introduced a more slender instrument with ivory cap, and later this was altered and made of wood only. Instruments with a trumpet-shaped end were devised by Dr. Williams about 1843. Since then the modifications of the monaural stethoscope have been

numerous, and more than thirty may be found scattered through the files of medical journals. Some have been hollow and others solid. They have been made of wood, metal, vulcanite, papier-maché, and other materials, either alone or in combination. Among others may be mentioned the stethoscopes of Walshe, Quain, Loomis, Cammann, and Clark. Previous to 1850 M. Landouzy, of Paris, constructed a binaural instrument having a number of gum-elastic tubes by which several persons could listen at once. This required three hands for its application, and was not found of any practical use. Many years before this Dr. Williams, of London, was accustomed to use a stethoscope made of two metal tubes attached to the bell of an ordinary stethoscope and with flat ear-pieces. This conveyed sounds with exaggerated intensity, but was inflexible and awkward of application. The double stethoscope of Dr. Leared, shown at the International Exhibition of 1851, was a great improvement. It consisted of two gutta-percha tubes attached to the chest-piece at one extremity and at the other to the ear-pieces. These tubes, being drawn apart and applied to the ears, were kept in place by their own elasticity.

In 1851, Dr. Marsh, of Cincinnati, patented a double stethoscope. This had a membrane stretching over its objective end, and two gum-elastic tubes leading from the chest-piece to the ears. In this instrument the ear-pieces were inconvenient; it required two hands for its application, and the sounds conveyed were muffled and confused. These circumstances rendered it of little value. Dr. Cammann was familiar with two of these instruments, Landouzy's and Marsh's, and it was chiefly the fact that Marsh's was patented which induced Dr. Cammann to devise a better one and give it freely to the profession. His binaural stethoscope, therefore, was not a new invention, but was, and is now, the best instrument of the kind devised. It was only after much labor and considerable expense that a satisfactory result was attained. The instrument was perfected in 1852, and described in the New York "Medical Times" of January, 1855. It is light, durable, easily carried, and a good conductor of sound. The ear-pieces are the best that have been devised, but room for improvement in this respect still remains. The attachment of a rim of soft rubber to the chest-piece, as devised by Dr. Snelling, is of advantage in applying it more closely to the inequalities of the chest. In most of the instruments now made the rubber band which served to draw the two tubes together is replaced by a spring. In the latest improvement the spring is placed in the screw which binds the tubes together.

Great care is required in the construction of the stethoscope, and many defective ones are sold. The knobs on the ear-pieces must be neither too large nor too small; if too small, they cause pain by their pressure; if too large, they allow external sounds to enter the ear. The tubes must be curved so that they enter the ear in the direction of the meatus. The flexible tubes must not be too stiff nor too long, and their movements must be noiseless.

A considerable variety of flexible stethoscopes is now in use. They may be generally described as consisting of a chest-piece, long flexible rubber tubes, and round ear-pieces. The ear-pieces are held in place either by being firmly pressed into the meatus, or by a spring passing over the head or under the chin. A flexible stethoscope is described by Mr. Brown in the "Lancet," March 3, 1877, in which the ear-pieces are oval. When placed in the ear with the long diameter vertical, they are said to remain readily in position. The differential stethoscope of Scott Alison is similar in mechanism to Cammann's, but has two chest-pieces—one for each ear, enabling the sounds from different regions of the chest to be conveyed to the two ears at the same time. The value of this stethoscope has been a matter of considerable controversy. It is claimed that it is capable of offering aid to diagnosis in two ways: (1) By the consecutive observation of the sounds of two regions of the chest by the different ears, and (2) by their simultaneous observation. We can listen over different parts of the chest with either ear by removing one or the other chest-piece, and thus can compare the sounds heard over different regions with great rapidity, and detect slight differences which might escape us in a prolonged examination. If we listen at two points simultaneously, and sound of the same quality but of different intensity is heard at each point, the weaker is eclipsed or nullified, and thus, by the eclipsing of a weaker impression through one ear by a stronger impression through the other, differences may be recognized which might otherwise escape detection. When hearing is impaired in one ear, this stethoscope can not be used satisfactorily.

The hydrophone is another instrument devised by Alison. It consists of an India-rubber bag about the size of a large watch and filled with water. Another inventor had previously constructed a wooden instrument filled with water, but it was not practically useful. Alison found that when water was interposed between two conducting media, sound was conveyed to the ear with increased intensity. The hydrophone may be employed as an instrument by itself

or in aid of the stethoscope. The increase of sound varies much with the material through which it is conducted. With firm, non-flexible, or solid stethoscopes, the hydrophone acts as a damper and diminishes sound. The more a stethoscope becomes a mere air instrument and departs from the character of a solid conducting medium, the more water adds to its acoustic value. This may explain why such opposite results have been obtained in the use of the hydrophone by different observers.

Some years ago the idea of a stethoscope containing an air-chamber in the chest-piece was suggested to me by Dr. Leaming. In 1884 ("Diseases of the Heart," by Constantin Paul; William Wood & Co., 1884) Dr. Constantin Paul devised a stethoscope with two flexible tubes leading to the ears, and a hollow chamber in the chest-piece, connected with a rubber bulb by a long flexible tube. If the air in the hollow chamber is exhausted, the instrument is held firmly against the chest.

My modification of Cammann's stethoscope ("New York Medical Journal," January 3, 1885) can be screwed on in place of the usual chest-piece.

In the pectoral end is an air-chamber which is completely closed by pressure against the chest, the inner and outer rims of the chamber being on the same level. Connected with this chamber by a small tubular opening is a rubber bulb through which the sound conducting tube passes. By pressure upon this bulb when the instrument is held in position, the air is exhausted in the hollow chamber, and the stethoscope is held firmly to the chest-wall. It requires some practice to use this modification successfully. The bulb should be strongly compressed, and then firm and even pressure made against the chest-wall, when the pressure upon the bulb should be at once relaxed. If this be done, the instrument is held in place during the examination, or at least for a considerable time.

I have used this instrument for more than a year, and am confirmed in my opinion of its value. By its use the closest possible contact is obtained with the parts under examination. Sound, in passing to the ear, is conveyed through two hollow chambers—one in the chest-piece, and the rubber bulb—both of which act as resonators and increase its intensity. Not only is the intensity of sounds increased, but their true quality is better appreciated. Another advantage is that the two hands of the auscultator are left free to practice the method of auscultatory percussion—a method which has not

yet received the attention it deserves, and which, it is to be hoped, will come into more general use.

Discussion.

Dr. Platt said it might be that his lack of success with Dr. Cammann's modified instrument, with which he had been pleased at first, had been due to the fact that he had not accustomed himself sufficiently to it. It was, of course, very convenient to have both hands at liberty, especially in auscultatory percussion. But an objection, as it seemed to him, was that the suction of the bulb displaced the skin and subcutaneous tissue, somewhat interfering with the transmission of sound, and at the same time there seemed to be a continuous slight roaring sound produced which he could not connect with any physiological state.

Dr. E. D. Hudson asked further regarding the principle governing the difference in action of the improved and that of the original Cammann stethoscope.

Dr. Cammann replied that the air reached the ear directly from the part of the chest to which the instrument was applied, as in the unmodified stethoscope, but the inside and the outside chambers seemed to act as resonators, and as a matter of fact the intensity of the sound was increased.

The President remarked that the double stethoscope undoubtedly did intensify the sound, but it also changed its quality, which was a disadvantage in studying pulmonary disorders. But, if one wished to compare cardiac sounds which were in close approximation to one another, it would enable the listener to locate the point of maximum intensity much better than with the naked ear. He had used Dr. Cammann's modified instrument somewhat, and had got the impression that it was only of advantage in auscultatory percussion. The ordinary stethoscope without the bulb was much more satisfactory to him generally than the modified one, but that might be due to the fact that he had not become accustomed to Dr. Cammann's modification.

APPENDIX.

CONSTITUTION AND BY-LAWS.

MEMBERS OF THE ASSOCIATION.

THE

CONSTITUTION AND BY-LAWS

OF THE

AMERICAN CLIMATOLOGICAL ASSOCIATION.

AMENDED AT NEW YORK, MAY 28, 1885.

CONSTITUTION.

Article I.—Name.

This Society shall be known as the American Climatological Association.

Article II.—Object.

The object of this Association shall be the study of *Climatology and Hydrology, and of Diseases of the Respiratory and Circulatory Organs.*

Article III.—Membership.

Section 1.—This Association shall consist of *active* and *honorary* members, the latter not to exceed twenty-five (25).

Sec. 2.—Names of candidates for active membership, indorsed by *two* (2) active members, shall be sent to the Secretary at least thirty (30) days before the annual meeting. On approval of the Council, the applicant shall be balloted for at the annual meeting. Three (3) black balls shall be sufficient to reject a candidate. The Council shall have power to nominate active members.

Sec. 3.—The power of nominating honorary members shall be vested in the Council. The election shall be conducted in the same manner as that for active members. Honorary members shall enjoy all the privileges of active members, but shall not be allowed to hold any office, or cast any vote.

Article IV.—Officers.

Section 1.—The officers of this Association shall consist of a *President*, two *Vice-Presidents*, a *Secretary and Treasurer*, who, with five other members, shall constitute the *Council* of the Association.

Sec. 2.—Nominations. The officers, including the Council, shall be nominated by a committee of five (5) members, which committee shall be nominated by the President at the first session of each annual meeting, and shall report at the business meeting.

Sec. 3.—Elections. The election of officers shall take place on the second day of the annual meeting. A majority of votes cast shall constitute an election.

Sec. 4.—The President, Vice-Presidents, Secretary and Treasurer shall enter upon their duties at the close of the annual meeting at which they are elected, and shall hold office until the close of the next annual meeting, or until their successors are elected.

Sec. 5.—Members of the Council, other than the President, Vice-Presidents, Secretary and Treasurer, shall hold office for five (5) years—except such of them as are elected at the first meeting of the Association. The first named of these shall retire at the end of one (1) year; the second at the end of two (2) years; the third at the end of three (3) years; the fourth at the end of four (4) years; the fifth at the end of five (5) years—their places to be supplied by the election of one (1) member at each annual meeting.

Sec. 6.—Vacancies. Any vacancy occurring among the officers of the Association during the year may be filled by the Council.

Article V.—Duties of Officers.

President and Vice-Presidents.

The President and Vice-Presidents shall discharge the duties usually devolving upon such officers. The President shall be *ex-officio* Chairman of the Council.

Secretary and Treasurer.

As Secretary, he shall attend and keep a record of all the meetings of the Association and of the Council, of which latter he shall be *ex-officio* Clerk. At each annual meeting he shall announce the names of all who have ceased to be members since the last report. He shall superintend the publication of the transactions, under the direction of the Council. He shall notify candidates of their election to membership. He shall send a preliminary notification of the annual meeting two (2) months previous thereto, and the programme for the annual meeting at least two (2) weeks previous to its assembly, to all the members of the Association. He shall also send notification of the meetings of the Council to the members thereof. At each annual meeting of the Association he shall read the minutes of the previous meeting, and of all the meetings of the Council that have been held during the current year.

As Treasurer, he shall receive all moneys due, and pay all debts therewith. He shall render an account thereof at the annual meeting, where an auditing committee shall be appointed to report.

Article VI.—Council.

The Council shall meet as often as the interests of the Association may require.

Four (4) members shall constitute a quorum.

It shall have the management of the affairs of the Association, subject to the action of the Association at its annual meetings.

It shall consider the claims of candidates recommended to it for admission to membership.

It shall not have the power to make the Association liable for any debts exceeding in total one hundred dollars ($100), in the course of any one year, unless specially authorized by a vote of the Association.

It shall have the entire control of the publications of the Association, with the power to reject such papers or discussions as it may deem best.

It shall have power to nominate active members at the annual meeting.

The Council shall have power to invite any gentleman, not a member, to read a paper at the annual meeting, on any subject within the scope of the objects of this Association.

The Council shall determine questions by vote, or—if demanded—by ballot, the President having a casting vote.

The Council shall constitute a Board of Trial for all offenses against the Constitution and By-Laws, or for unbecoming conduct, and shall have the sole power of moving the expulsion of any member.

The President, or any two members, may call a meeting, notice of which shall be transmitted to every member two (2) weeks previous to the meeting.

Article VII.—Papers.

Section 1.—The titles of all papers to be read at any annual meeting shall be forwarded to the Secretary, not later than one (1) month before the first day of the meeting, in order to appear on the printed programme.

Sec. 2.—No paper shall be read before the Association which has already been printed or been read before another body.

Article VIII.—Quorum.

A Quorum for business purposes shall be ten (10) members.

Article IX.—Amendments.

This Constitution may be amended by a four-fifths ($\frac{4}{5}$) vote of all the members present at an annual meeting, provided that notice of the proposed amendment has been printed in the notification of the meeting at which the vote is to be taken.

BY-LAWS.

1. Meetings of the Association shall be held annually, and last for two (2) days.

2. The time and place of the meetings shall be determined by the Council.

3. The dues of active members shall consist of an annual assessment not to exceed five ($5) dollars. Members in arrears shall not be entitled to vote. Those in arrears for two (2) years may be dropped from membership by recommendation of Council.

4. Order of business.

First day—Afternoon session:

Calling the roll of members.
Minutes of previous meeting.
President's address.
Reading and discussion of papers.
Appointment of nominating committee.

Evening session:

Reading and discussion of papers.

Second day—Morning session:

Report of nominating committee.
Reading and discussion of papers.

Afternoon session:

Business meeting.
Treasurer's report.
Election of officers.
Miscellaneous business.

Public meeting.
Reading and discussion of papers.

Any of these By-Laws may be amended, repealed, or suspended by a two-thirds vote of the members present at any meeting.

MEMBERS OF THE ASSOCIATION.

AIKEN, S. C.

Geddings, W. H.

ALBANY, N. Y.

Ward, Samuel B., 135 N. Pearl Street.

ANN ARBOR, MICH.

Palmer, A. B., University of Michigan.

ATLANTA, GA.

Miller, H. V. M., 43 Walton Street.

ATLANTIC CITY, N. J.

Reed, Boardman.

BALTIMORE, MD.

Donaldson, Frank, Sr., 108 Park Avenue.
Donaldson, Frank, Jr., 108 Park Avenue.
Van Bibber, W. C., 47 Franklin Street.

BOSTON, MASS.

Bowditch, V. Y., 113 Boylston Street.
Garland, G. M., Hotel Aubrey.
Hooper, Franklin H., 59 Marlborough Street.
Knight, F. I., 131 Boylston Street.
Mason, A. L., 265 Clarendon Street.
Shattuck, F. C., 135 Marlborough Street.

BROOKLYN, N. Y.

Butler, G. R., 402 Franklin Avenue.
French, T. R., 469 Clinton Avenue.
Kretzschmar, P. H., 405 Clinton Avenue.
Platt, J. H., 450 Clinton Avenue.
Westbrook, B. F., 174 Clinton Street.
Williams, H. F., 131 Gates Avenue.

CHICAGO, ILL.

Ingals, E. Fletcher, 64 State Street.
Johnson, H. A., 4 Sixteenth Street.

CINCINNATI, O.

Whittaker, Jas. T., 100 W. Eighth Street.

COLORADO SPRINGS, COL.

Eskridge, J. T.

COLUMBUS, O.

Kinsman, D. N., 60 E. Broad Street.

DENVER, COL.

Dennison, Charles, Fourteenth and Champa Streets.

DETROIT, MICH.

Shurly, E. L., 25 Washington Avenue.
Inglis, David, 21 State Street.

EL PASO DE ROBLES, CAL.

Barger, D. E.

HOT SPRINGS, ARK.

Garnett, Algernon S.

JACKSONVILLE, FLA.

Kenworthy, C. Y.

KANSAS CITY, MO.

Schauffler, E. W., 1221 Washington Street.

LANSING, MICH.

Baker, Henry B., 726 Ottawa Street.

LOS ANGELES, CAL.

Orme, H. S., Box 1045.

LOUISVILLE, KY.

Coomes, M. F., 423 Chestnut Street.

MANSFIELD, O.

Reed, R. Harvey.

MILLBORO' DEPOT, VA.

Cabell, J. L.

NEW YORK.

Bell, A. N., 113 Fulton Street.
Bosworth, F. H., 26 West Forty-sixth Street.
Bradley, Edward, 19 West Thirtieth Street.

Cammann, D. M.,	19 East Thirty-third Street.
Dana, C. L.,	50 West Forty-sixth Street.
Hudson, E. Darwin,	227 West Twenty-second Street.
Jarvis, W. C.,	25 East Thirty-first Street.
Leaming, James R.,	160 West Thirty-third Street.
Loomis, A. L.,	31 West Thirty-fourth Street.
Page, R. C. M.,	31 West Thirty-third Street.
Rice, C. C.,	115 East Eighteenth Street.
Robinson, Beverley,	37 West Thirty-fifth Street.
Shirmer, G. P.,	359 West Forty-second Street.
Smith, A. H.,	22 East Forty-second Street.
Tyndale, J. H.,	38 East Tenth Street.
Weber, Leonard,	25 West Forty-sixth Street.

PHILADELPHIA, PA.

Bruen, E. T.,	1531 Chestnut Street.
Cohen, J. Solis,	1431 Walnut Street.
Curtin, R. G.,	22 South Eighteenth Street.
Keating, John M.,	1504 Walnut Street.
Musser, John H.,	3705 Powelton Avenue.
Pepper, William,	1811 Spruce Street.
Seiler, Carl,	1346 Spruce Street.
Walker, J. B.,	1617 Green Street.
Wilson, J. C.,	1437 Walnut Street.

PITTSBURG, PA.

Daly, William H.

SANTA FÉ, N. M.

Longwell, R. M.

SARANAC LAKE, N. Y.

Trudeau, E. L.

SHARON SPRINGS, N. Y.

Williams, G. A.

ST. LOUIS, MO.

Glasgow, W. C., 2847 Washington Avenue.

ST. PAUL, MINN.

Jones, Talbot, 357 Jackson Street.

SYRACUSE, N. Y.

Didama, H. D., 112 South Salina Street.

THOMASVILLE, GA.

Hopkins, T. S.

U. S. A.

Matthews, William,	Surgeon-General's Office.

Utica, N. Y.

Ford, Willis E.,	266 Genesee Street.

Washington, D. C.

Garnett, A. Y. P.,	1317 New York Avenue.
Johnston, W. W.,	1401 H Street, N. W.